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Snow Leopard

Photo by Dr. Dushyant Singh Gaur



Scaly breasted Munia

Photo by Manish Dev



Red Vented Bulbul

Photo by Manish Dev

Editorial Note

Editorial Board of "Cheetal" wishes to inform our readers about the following points.

1. It was notified in the earlier issue of "Cheetal" that Mr. Anand Singh Negi, President of our society W.P.S.I. is no more.
2. In memory of Late Mr. A.S. Negi, we have decided to publish next issue of "Cheetal" Vol. 52, No. 3 & 4 (2015) dedicated to him and his work for wild life.
3. Members are requested to send their write ups about Mr. Negi who have been known to him by November 15, 2015.
4. Researchers on wildlife biology are specially invited to publish their work in the Journal of Wildlife Preservation Society of India - "Cheetal", free of charge
5. Wildlifers, in general, are requested to send their observational articles for publication in the "Cheetal".
6. We would like to give top priority to wild life photographers. Please send photographs (preferably post card size) of wildlife (Animals/Plants).
7. Cartoonists on wildlife are most welcome to send their work for publication in "Cheetal". Puzzles, Quiz, Objective type Questions Answers and Poems on wildlife are also welcome.
8. We invite your attention to ignite the younger generation to become member of W.P.S.I and write about wildlife animals & plants.
9. Student member will be benefitted by reading the articles in "Cheetal" on wildlife biology and conservation, which is now in their curriculum for study.
10. Lastly, it is requested to our bonafide members to popularise the Wildlife Preservation Society of india in your neighbourhood to become the member and participate in its activities.

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Snow Leopard: the elusive cat of Himalayas

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The elusive Snow leopards inhabit mountainous terrains at elevations from 3,000 to 4,500 m (9,800 to 14,800 ft) across 12 northern range countries of Central and South Asia; its territory spread across Afghanistan, Bhutan, China, India, Kazakhstan, Kyrgyz Republic, Mongolia, Pakistan, Russia, Tajikistan, and Uzbekistan. There are 23 National Parks and nature reserves spread across these countries, which are recognized as potential snow leopard habitat and are dedicated to its conservation; seven of these national parks are in India.

In India, the snow leopard inhabits the Himalayan ranges in the states of Jammu & Kashmir, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh, its habitat estimated at less than 90,000 km². Uttarakhand, one of the richest biodiversity hotspots in the India, straddling the Himalayas as well as the Gangetic plains, has two of the seven Indian snow leopard national parks – the Nanda Devi National Park and the Valley of Flowers National Park, both of which hold the status of UNESCO Natural World Heritage Site, and are potential breeding grounds of snow leopards.

The Snow Leopard (*Panthera uncia* syn. *Uncia uncia*), based on genotyping studies, has been considered a member of the genus *Panthera* since 2008. Despite the common name given to the snow leopards, the tiger is considered its sister species, with the leopard being a more distant relative. Snow leopard is slightly smaller than the big cats like tiger, exhibiting a range of sizes, generally weighing between 27 and 55 kg, with an occasional large male reaching 75 kg. They have a relatively short body, measuring in length from the head to the base of the tail 75 to 130 cm. However, the tail is quite long, at 80 to 100 cm. It stands about 60 cm at the shoulder. It has long, thick fur, and its base color varies from smoky gray to yellowish tan, with whitish underparts. It has dark grey to black open rosettes on its body, with small spots of the same color on its head and larger spots on its legs and tails. Unusual among cats, its eyes are pale green or grey in color.

Snow leopards show several adaptations for living in a cold, mountainous environment. Their bodies are stocky, their fur is thick, and their ears are small and rounded, all of which help to minimize heat loss. Their paws are wide, which distributes their weight better for walking on snow, and have fur on their undersides to increase their grip on steep and unstable surfaces; it also helps to minimize heat loss. Snow leopards' tails are long and flexible, helping them to maintain their balance, which is very important in the rocky terrain they inhabit. Their tails are also very thick due to storage of fat and are very thickly covered with fur which allows them to be used like a blanket to protect their faces when asleep. The snow leopard has a short muzzle and domed forehead, containing unusually large nasal cavities that help the animal breathe the thin, cold air of their mountainous environment.

The snow leopard cannot roar ! This inability to roar is due to the absence of the larynx. Snow leopard vocalizations include hisses, chuffing, mews, growls, and

wailing.

The snow leopards are crepuscular, being most active at dawn and dusk. They are known for being solitary, extremely secretive and well camouflaged. Snow leopards are carnivores and actively hunt their prey by ambushing them in the rocky terrain. Like many cats, they are also opportunistic feeders, eating whatever meat they can find, including domestic livestock. Unusual among other cats, snow leopards also eat a significant amount of vegetation, including grass and twigs.

Snow leopards may also hunt in pairs, especially the mating pairs. Females rear their cubs in rocky dens in the mountains for extended periods. The litter can be from two to five cubs. Snow leopards live in well-defined home territory ranging from 12 to 40 km², marked by their scent of urine or scat, with up to five to ten animals per 100 km².

The snow leopard is listed as 'Endangered' on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species. In India, the population of snow leopards in the wild, is estimated to be around 200 to 600.

In 2013 government leaders and officials from all 12 countries encompassing the snow leopard's territory, came together at the Global Snow Leopard Forum (GSLF) initiated by the President of the Kyrgyz Republic, to jointly deliberate on the conservation strategies for the snow leopard and its threatened mountain ecosystem. The Global Snow Leopard and Eco-system Protection Program (GSLEP) was developed as a joint initiative of the 12 snow leopard range countries, with governments, international agencies, civil society, and the private sector, join hands to secure the long-term survival of the snow leopard in its natural ecosystem. The goal of the GSLEP is to work together to identify and secure at least 20 healthy populations of snow leopards across the cat's range by 2020, or "20 by 2020". Many of these populations will cross international boundaries.

On June 29, 2015, Uttarakhand Forest department officials caught a camera trap photograph of a snow leopard in the icy heights of Bageshwar district at an altitude of 4,100 meters above sea level, in Kumaon Himalayas. This is the first documented evidence of the presence of the species in Kumaon region, though it is known to prowl the wilds of Garhwal region, where earlier photographic evidence of snow leopard was found in the Gangotri National Park and Nanda Devi Biosphere Reserve in 2010. The documentary evidence of the presence of the elusive snow leopard in Kumaon, is very significant. The photograph provides irrefutable proof of the presence of at least 11 snow leopards in the state, encouraging the forest department to prepare for better conservation strategy for the snow leopard, one of the most endangered species on the planet.

Snow leopard is the 'State Animal' of Himachal Pradesh, India. It has also been declared the "National Heritage Animal" of Pakistan.

2015 has been designated as International Year of the Snow Leopard.

Morphological and Taxonomical description of Seven spot Ladybird beetle *Coccinella septumpunctata* L. (Coleoptera: Coccinellidae) reported from different study sites of District Dehradun (Uttarakhand), India

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ABSTRACT

Present study was carried out to know the morphological and taxonomical description of seven spot ladybird beetle *Coccinella septumpunctata* L. (Coleoptera: Coccinellidae) reported from different study sites of District Dehradun, Uttarakhand, India. The beetle is oval, medium sized about 6.5-7.0 mm long and 5.0-5.5 mm broad across the middle elytra. The head bears a pair of black eyes and a pair of brown antennae. The antennae are provided with small sensory hairs all over. The elytra are red in colour with seven small black spots. Three small spots are located on each elytra and the remaining one is situated at the median apical margin of both elytra. From above study, it was also observed that *C. septumpunctata* is the most abundant and the commonest predator of aphids, which is found active almost throughout the year. The adults have been found feeding on cotton and mustard aphids.

Key words: Ladybirds, Morphological, Taxonomical, Predator

INTRODUCTION

Coccinellidae is a well-known beetle family, worldwide distributed and divided into six subfamilies: Coccidulinae, Coccinellinae, Scymninae, Chilocorinae, Sticholotidinae and Epilachninae (Vandenberg, 2002). These are among the most familiar beetles and have common names around the world, such as lady cows, God's cows, Ladybugs, Ladybird beetles and virgin's insect (Moreton, 1969). These are small to medium size beetles with an oval, oblong or hemispherical body shape (Majerus 1994).

The family Coccinellidae comprises 5,200 described species worldwide (Hawkeswood, 1987). Joshi and Sharma (2008) have reported 31 species of Ladybeetles with 19 new records from district Haridwar, India. Sharma and Joshi (2010) have also reported 25 species of Ladybeetles with 14 new records from district Dehradun, India. The richness and variety of a natural community can be described as "diversity", whereas the ratio between number of species and importance value of individuals is called species diversity indices of the total number of species (Odum, 1971). In a community, a relatively small percentage of the organisms are usually abundant and they have large importance value, whereas large percentages are rare and have small importance value.

Ladybirds (Coleoptera: Coccinellidae) are predators of phytophagous pests, such as aphids, leaf-hoppers, scale insects, mealybugs, mites and other soft bodied insects diaspid, coccids, adelgids, aleyrodids, pentatomids, thrips and acarids (Hodek

and Honek, 1996; Dixon, 2000; Omkar and Bind, 1996; Joshi and Sharma, 2008; Sharma and Joshi 2010). These prey species are, however, not equally suitable for growth, development and reproduction of ladybirds, with suitability differing in relation to habitat, nutritional requirements of the predator and the biochemical contents of their prey (Hodek, 1956, 1962; Blackman, 1965, 1967; Kalushkov and Hodek, 2001, 2004; Omkar and Srivastava, 2003; Omkar and Bind, 2004; Omkar and James, 2004).

The natural enemies once established in the ecosystem are self powered, self sufficient and self regulating, requiring no further investments in control (Pimental, 1991). The introduction of the vedalia ladybird, *Rodolia cardinalis* Mulsant from Australia into California in 1888 to control cottony cushion scale, *Icerya purchasi*, which threatened the citrus industry, is widely regarded the most successful instance of biological pest control by coccinellids (Majerus, 1994).

Predaceous coccinellids have a wide range of accepted food. The larvae prey on the same prey as the adults. Hence, it is the adults, which select a certain type of food for the larvae, while laying their eggs. The objective of this study was to investigate the morphological and taxonomical description of seven spot ladybird beetle *Coccinella septumpunctata* L. (Coleoptera: Coccinellidae) reported from different study sites of District Dehradun, Uttarakhand, India.

MATERIALS AND METHODS

Study area: The present study was carried out in all ecosystems of Dehradun district, which is situated at 28° 53' 24" to 31° 27' 50" N latitude and 77° 34' 27" to 81° 02' 22" E longitude. The study area shows three distinct seasons winter, summer and monsoon. The collections of coccinellids were carried out from agricultural field (wheat- *Triticum vulgare* and mustard *Brassica campestris* L.), garden, orchard and forest ecosystem.

Sampling method: Sampling of insects was conducted at an interval of 30 days during July 2014 to June 2015. The insects were collected by visual hand picking method.

Preservation and identification of specimens: The collected insects were transferred into jars containing ethyl acetate soaked cotton. These jars were brought to the laboratory and the insects were stretched and pinned. These were oven dried at 60 C for 72 hours in order to preserve them and then set into wooden boxes and labeled according to their systematic position. Each specimen was tagged with the information about host plants, locality and date. To protect the specimens from the insect pests, naphthalene tablets were added to collection boxes. The adult specimens of each species were carefully studied for all details under binocular microscope. The insects were separated into different species with the help of available keys.

Morphometric parameters: Ten eggs, which were more than five hours old, were selected randomly and measured for their length and width on a micrometer under microscope. The larvae from each representative instars were randomly selected, killed and measured with the help of micrometer. The pupal stage of beetle was also determined and measured for recording their length and width. The body of male and female adults was also

measured from head to end of abdomen, by the help of micrometer (Mari *et al.*, 2004).

RESULTS AND DISCUSSION

(I) Morphological Description of Seven spotted ladybeetle

Coccinella septumpunctata (Linnaeus)

The beetle is oval, medium sized about 6.5-7.0 mm long and 5.0-5.5 mm broad across the middle elytra. The head bears a pair of black eyes and a pair of brown antennae. The antennae are provided with small sensory hairs all over. The elytra are red in colour with seven small black spots. Three small spots are located on each elytra and the remaining one is situated at the median apical margin of both elytra. *C. septumpunctata* is the most abundant and the commonest predator of aphids, which is found active almost throughout the year. The adults have been found feeding on cotton and mustard aphids.

Coccinella septumpunctata var *divaricata* (Olivier)

The beetle is oval, medium sized about 6.5-7.0 mm long and 5.2-5.7 mm broad across the middle elytra. The head bears a pair of black eyes and a pair of brown antennae. The elytra are red in colour. The margin of each elytra towards the middle end is black in colour and become connect at anterior end near head region. In each elytra, this black marginal strip also connects two black coloured spots in which anterior spot is smaller than posterior black spot. These two spots also connect with each other by a thin black line to form a rectangular structure in each elytra. The adults have been found feeding on aphids.

(II) Taxonomic Description of Coccinellids

The scientific name of the species is followed by the name of the author and year of original description of species.

Genus: *Coccinella* Linnaeus, 1758

Coccinella Linnaeus, 1758: 364. - Iablokoff-Khnzorian, 1979: 66; 1982: 341.

Type species: *Coccinella septumpunctata* Linnaeus, 1758, by subsequent designation of Latreille, 1810: 432.

Coccinella (Dobzhanskia) Iablokoff-Khnzorian, 1979: 70. Type species: *Coccinella undecimpunctata* Linnaeus, by original designation.

Coccinella septumpunctata (Linnaeus):

Coccinella 7-punctata Linnaeus, 1758: 365 (?LSL).

Coccinella septumpunctata: Korschefsky, 1932: 486 (cat.).- Schaefer & Semyanov, 1992: 125-134 (World parasite list & Bibliography).

Coccinella divaricata Olivier, 1808: 1001 (lectotype; UCCC).- Korschefsky, 1932: 457 (cat.).- Mader, 1936: 375 (Syn.).- Sudha Rao, 1962: 1341 (status).- Gordon, 1987: 13 (lectotype design.).

Coccinella confusa Wiedemann, 1823: 72. - Mulsant, 1850: 112 (As a var. of *divaricata*).- Sudha Rao, 1962: 1341 (status rev., Morphs. fig.).

Coccinella bruckii Mulsant, 1866: 90. - Crotch, 1874: 46.

Coccinella septumpunctata brucki: Korschefsky, 1932: 491.

Distribution: Throughout India, Pakistan, Sri Lanka and North America.

Coccinella septumpunctata var *divaricata* (Olivier):

- reproduction of a biocontrol agent, *Cheilomenes sexmaculata* (Fabricius) (Coleoptera: Coccinellidae). *Biocontrol. Sci. Tech.*, 14: 665-673.
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- Vandenberg, N. (1996). Notes on *Oenopia* Mulsant (Coleoptera: Coccinellidae). *Proceedings of the Entomological Society of Washington*, 98 (3): 385-389.

Hair analysis of endangered species of squirrels *Petinomys fuscocapillus* and *Ratuf indica* (Mammalia: Rodentia: Sciuridae) by scanning electron microscope and energy diffraction X-ray analysis techniques—for wildlife forensic

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Abstract:

Trichotaxonomy is being practiced for identification of mammalian species in wildlife forensic, ecological study, wildlife management and conservation. Previous studies revealed that the structure of the hair has definite taxonomic value. The present study focused on the identification of squirrel species (*Petinomys fuscocapillus* and *Ratuf indica*) on the basis of differences in hair structural characteristic and elemental constitution as analyzed by scanning electron microscope (SEM) and Energy diffraction X-ray analysis (EDX), respectively. Very few EDX studies to characterize the species on the basis of elemental composition were done Dorsal guard hairs were collected from the specimen and processed for SEM and EDX analysis by standard method. Previous investigations focused on the microscopic surface analysis of hair by SEM, but in the present study elemental analysis of two species of squirrel have been evaluated using EDX coupled with SEM for analysis of Sulphur, Potassium, Sodium, Magnesium, Aluminium, Oxygen, Chlorine and Silicon. Remarkable difference has been observed in Sodium and Sulphur composition among two species. Thus, it was concluded that EDX along with SEM can be helpful tool for identification of species and could be adopted in wild life forensic, prey-predator relationship, food habit and wildlife management studies.

Key words: Trichotaxonomy, *Petinomys fuscocapillus*, *Ratuf indica*, SEM, EDX

Introduction:

India is known for its great biodiversity, having 8% of the world's biodiversity with 60% of world's tiger, 50% of Asian elephants, 70% of Asian rhinos, and the only population of Asiatic lion in wild [Dey 1996]. Rampant poaching and illegal trade posed an ever increasing threat of extinction on our wildlife treasure. As far the wildlife crime investigation concerned in most of the cases related to mammals, hair and skin are the only physical evidence. History of mammalian identification based on hair characteristics tracked back to the 19th century. Among the earlier workers (Mc Murlrie 1986; Saxinger 1925; Williams, 1934 and Hardey and Plitt 1940) Hausman 1930 and Hausnian 1920; 1924 were used written description and simplified drawing to present the configuration of cuticular scale and medullae of different hairs of 166 fur bearing mammals. Methiak (1938) described the method of hair based identification of mammals of southern Michigan. Wildman (1954) published a booklet on animal fibers of the industrial importance and discussed their origin and identification. Appleyard in 1960

described the key to the identification of hair of California Mammals. Similarly, Mayer (1952) described identification of California mammals based characteristics of dorsal Guard hairs which had been taken from one small area of the pelage. A descriptive study of hair of some Indian mammals was done by the Nath and Joseph (1981) and Koppikar and Sabnis (1976). Sahajpal and Goyal (2005; 2006 and 2008) highlighted the usefulness of microscopic hair characteristic for species identification for dealing wildlife offence cases in India. Shajpal *et al.*, (2008) reported the guard hair characteristics of four Indian bear species and mongoose. A reference guide for identification of selected species of Indian mammals representing the features of primary of guard hair (dorsal) of 57 species is used for solving the wildlife forensic cases (Bahuguna *et al.*, 2007). Trichotaxonomy of squirrels of Indian species revealed the utility of hair characteristics in identification of small mammals (Bahuguna 2007; 2008).

Earlier, reports on the hair structure of Tasmanian marsupials and monotremes by Lyne and McMahon (1951) suggested that a detailed microscopic examination of hair of the mammals would be of some taxonomic value. A detailed study dealing entirely with the dorsal hair of Chiroptera was reported by Benedict (1957). Though a considerable research has been carried out on the cuticular structure of the hair of mammalian species (Brunner and Comann 1974) but so far cuticular structure of few Indian species has been worked out (Koppikar and Sabnis 1976; 1977, Tirink 1991, Chakraborty *et al.*, 1966; 1999. Chakraborty and Chakraborty (1999) studied the macro and microscopic characteristics of the dorsal guard hairs of eleven species of Indian lesser cats. Brunner and Comann (1974) have also worked on 71 mammalian species emphasized on the identification of mammals based on cuticular hair structure, medulla pattern as visualized by cross section. Similarly, Tirink (1991) has classified the various west European mammals (23 species) into various orders and in the same way Moore *et al.*, (1974) provided the description and key of identification of the most Wyoming mammals.

Thus, the present study described the features of primary guard hair from dorsal body regions, which is essential for identification of species for wildlife forensic as well as for ecological studies as done in case of genus *Ratufa* of family Sciuridae (Bahuguna 2008) and also in case of other group of mammals (Mayer 1952; Bahuguna 2008; De 1996 and Tirink, 1991). Since, little work so far has been done on the trichotaxonomy of family Sciuridae (Bahuguna 2007), although this family is known to be poached throughout the world due to their skin and food thus it becomes necessary to devise some relatively convenient and accurate method to identify them. Thus, the objective of the present study was to know the differences in the microscopic structure and elemental composition of dorsal guard hair of the two different species (*Petinomys fuscocapillus* and *Ratuf indica*) of squirrels by SEM and EDX analysis. We believe this study would add significantly in ongoing research in the trichotaxonomy and wildlife forensics, conservation and management.

Materials and Method:

Hair Collection: Hairs of all two species *Petinomys fuscocapillus* and *Ratuf indica* were collected from Department of Mammals, Zoological Survey of India, Kolkatta and from the museum of North Regional Centre (NRC), Zoological Survey of India, Dehradun, India.

Primary guard hair was collected randomly from dorsal and ventral regions of the museum specimen. The hairs were taken using forceps with gloves to avoid contamination and were packed in zip-lock bags followed by paper envelopes.

Processing of hair samples:

Cleaning: For SEM analysis primary guard hair were sorted out from the samples were washed twice with acetone to make it complete dirt free for accurate observation. The sample was washed in graded series of Acetone i.e. 50%, 70%, 90%, and 95% of acetone for 30 min in each grade and finally kept in pure acetone overnight. However, sonication can also be used to wash hairs in water and afterwards in isopropyl alcohol followed by drying.

Specimen Coating: Washed and dried hairs were placed on Stub (13 mm radius aluminum sample holder) by the help of double sided carbon tape (Jeoldatum ltd, Japan) and dissected from the middle portion avoiding the tip and root region of hair, followed by Carbon (Carbon thread, Quorum-Q150RES) coating as per given in standard protocol.

When the pressure in chamber is below 0.1 milibar vacuum, the argon leak valve is used to flush the chamber with Argon for a period of about 10 seconds (needle of vacuum meter should read approximately 0.5 milibar during flushing). The vacuum is allowed to recover by closing leak valve. When the pressure is around 0.7 milibar, the flushing procedure is then repeated. After the second flushing the specimen chamber is pumped down to 0.02-0.03 milibar 4-5 minutes are required for the specimen chamber to reach thermal equilibrium at around 5 °C. The operation switch is turn to 'SET HT' and the voltage is kept at 2.5 KV. The leak value is adjusted to give a current reading of about 18mA.

SEM and EDX analysis: The samples were examined under Scanning Electron Microscopy [SEM] using Zeiss EVO 40EP for imaging and elemental analysis at Wadia Institute of Himalayan Geology, Dehradun, India. Examination was done with working distance (WD) of 11.8 to 12.2 mm and Electron Gun frequency at 20 kV.

For EDX analysis, area was selected on the surface of hair. SEM Zeiss EVO 40EP was used with most advanced LN2 free EDX of Bruker make (X Flash 4010 SDD) X-ray detector with super light element window with active area- 10 mm². The EDX facility provides qualitative and quantitative compositional analysis of the sample including elemental composition of the selected area. An electron beam 10-20 Kev strikes on the sample due to that x-ray emitted from the material (like hair) and energy of x-ray emitted gives the elemental composition.

Results:

Remarkable difference in cuticular scale pattern between the primary guard hair of two species of the squirrel have been observed and showed a variation between the species examined. In *Pentinomys fuscopillus* the regular wave scale pattern in dorsal and

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Remarkable difference in cuticular scale pattern between the primary guard hair of two species of the squirrel have been observed and showed a variation between the species examined. In *Pentinomys fuscopillus* the regular wave scale pattern in dorsal and

ventral hairs was observed, whereas scale margin are smooth in dorsal hairs as compared to the rippled in ventral hairs (Image 1, 2). Distance between scales was observed near in dorsal and ventral hairs in *P. fuscopillus*. Similarly, in *R. indica* the scale pattern is irregular type in dorsal and ventral hair, while the scale margins are smooth in dorsal and rippled in ventral hairs (Image 3, 4). Contrary to the *P. fuscopillus*, in *R. indica* the scales are distantly placed and in irregular wave pattern (Table 5).

As far elemental composition is concerned (Table 6) for inter-species comparison Sodium was observed to be present in both type of hairs in *P. fuscopillus* whereas absent in *R. indica*. Sulphur was observed to be present in very high percentage in ventral hairs of *P. fuscopillus* (7.22 %) than ventral hairs of *R. indica* (0.27%). Potassium percentage showed no major differences, whereas, Manganese occurred in small percentage in ventral hairs of *P. fuscopillus* and absent in ventral hairs of *R. indica*. In ventral hairs of *P. fuscopillus* Aluminium occurred in traces but in *R. indica* it is absent. However, oxygen percentage showed no larger differences except slightly higher percentage in *R. indica*. In dorsal hairs of *P. fuscopillus* Chlorine was present while in *R. indica* it was absent. Silicon was also noted to be present in trace amount in ventral hairs of *P. fuscopillus* and absent in *R. Indica*.

Microscopic structure analysis of hairs by SEM

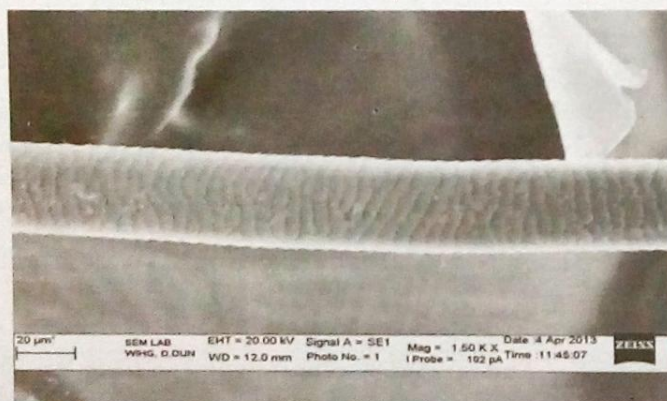


Figure 1. Scanning electron microscope image of dorsal hair of species *Petinomys fuscopillus* (Travancore) Magnification 1.50 kX

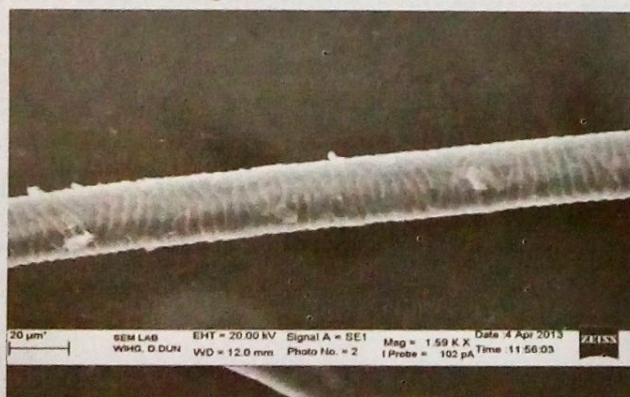


Figure 2. Scanning electron microscope image of ventral hair of species *Petinomys fuscopillus* (Travancore) Magnification 1.59 kX

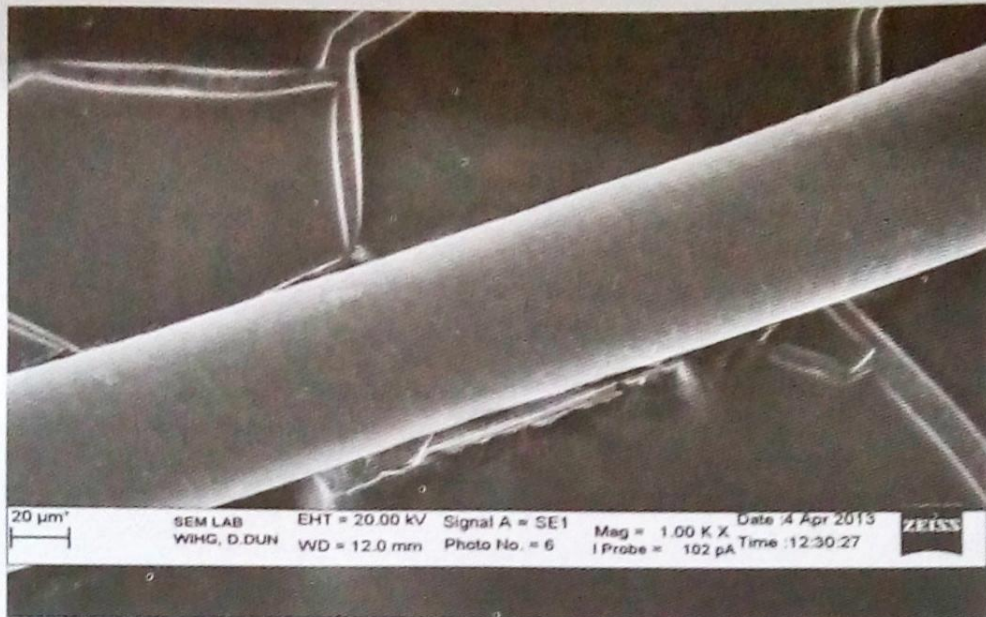


Figure 3. Scanning electron microscope image of dorsal hair of species *Ratuf indica*. Magnification 1.0 kX

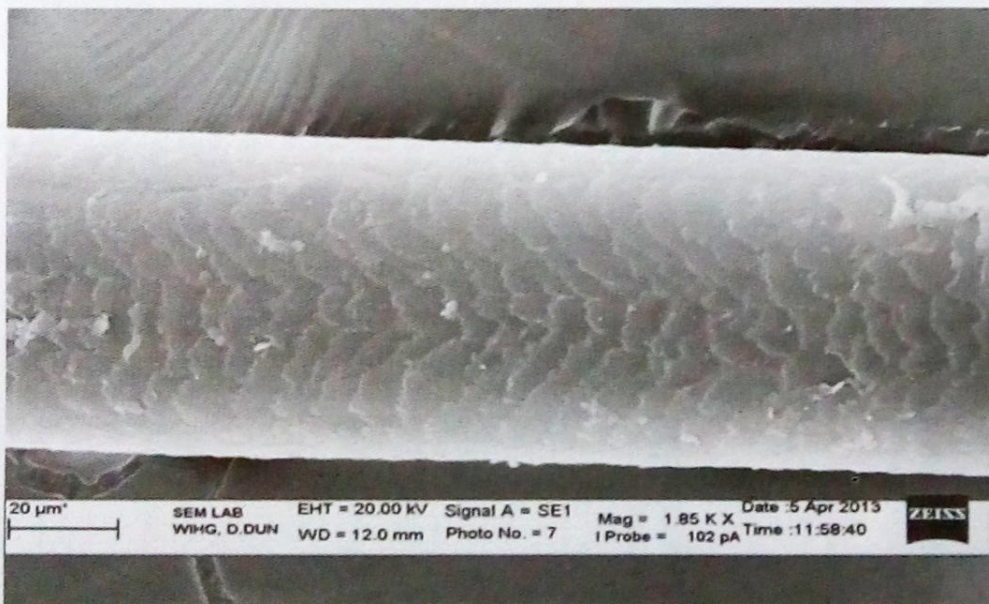


Figure 4. Scanning electron microscope image of ventral hair of species *Ratuf indica*. Magnification 1.85 kX

EDX analysis of hair sample

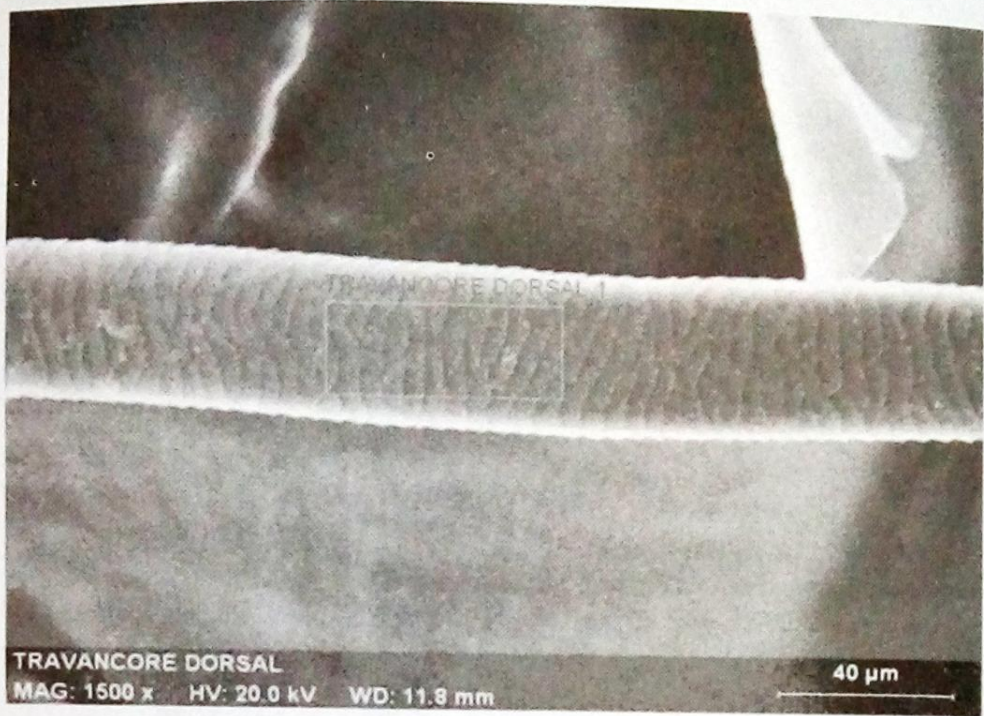


Figure 5. EDX analysis by SEM of dorsal hair of species *Petinomys fuscocapillus* (travancore)

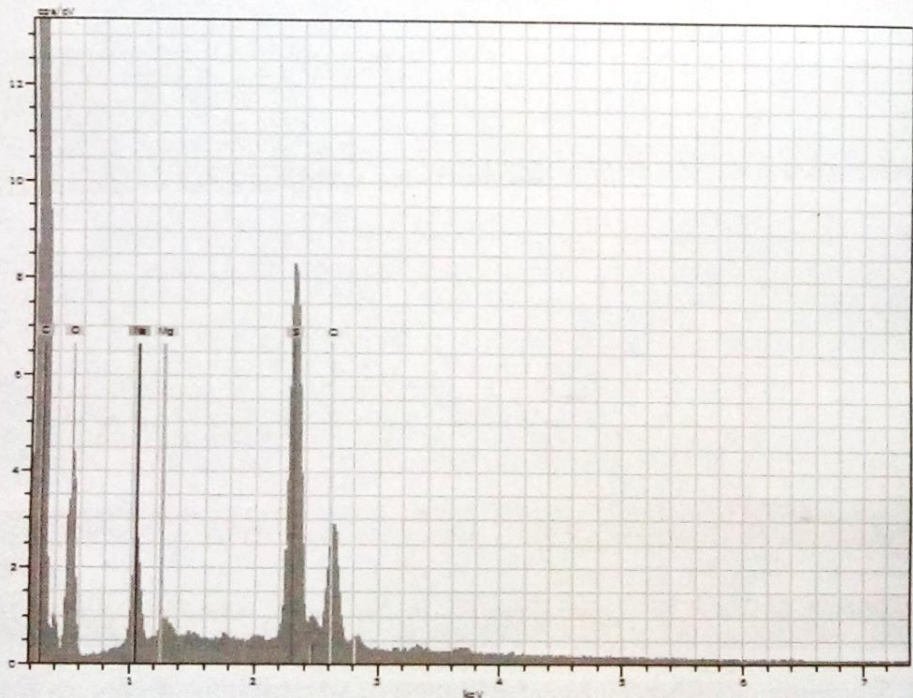


Figure 6. Spectrum of elemental composition of dorsal hair of species *Petinomys fuscocapillus* (travancore)

El AN Series unn. C norm. C Atom. C Error
[wt.-%] [wt.-%] [at.-%] [%]

S 16 K-series	7.22	7.22	3.87	0.3
Na 11 K-series	4.28	4.28	3.21	0.3
Cl 17 K-series	2.90	2.90	1.41	0.1
Mg 12 K-series	1.36	1.36	0.96	0.1
C 6 K-series	0.00	0.00	0.00	0.0
O 8 K-series	84.24	84.24	90.55	27.0

Total: 100.00 100.00 100.00

Table 1. Elemental composition of dorsal hair of species *Petinomys fuscocapillus* (travancore)

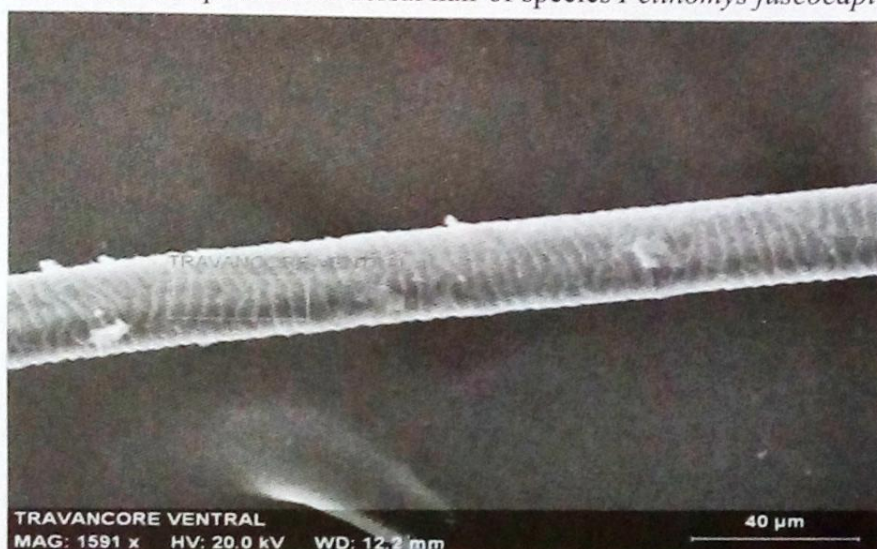


Figure 7. EDX analysis by SEM of ventral hair of species *Petinomys fuscocapillus* (travancore)

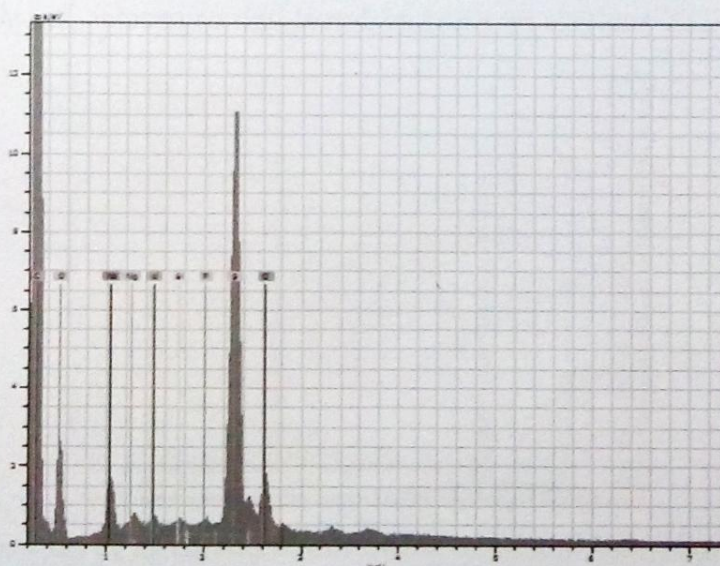


Figure 8. Spectrum of elemental composition of ventral hair of species *Petinomys fuscocapillus* (travancore)

El	AN Series	unn. [wt.-%]	C norm. [wt.-%]	C Atom. [at.-%]	C Error [%]
S	16 K-series	8.15	8.15	4.32	0.3
Na	11 K-series	2.06	2.06	1.52	0.2
Cl	17 K-series	1.27	1.27	0.61	0.1
Mg	12 K-series	0.44	0.44	0.31	0.1
Al	13 K-series	0.19	0.19	0.12	0.0
P	15 K-series	0.13	0.13	0.07	0.0
Si	14 K-series	0.09	0.09	0.06	0.0
C	6 K-series	0.00	0.00	0.00	0.0
O	8 K-series	87.66	87.66	93.00	28.2
Total:		100.00	100.00	100.00	

Table 2. Elemental composition of ventral hair of species *Petinomys fuscocapillus* (travancore)

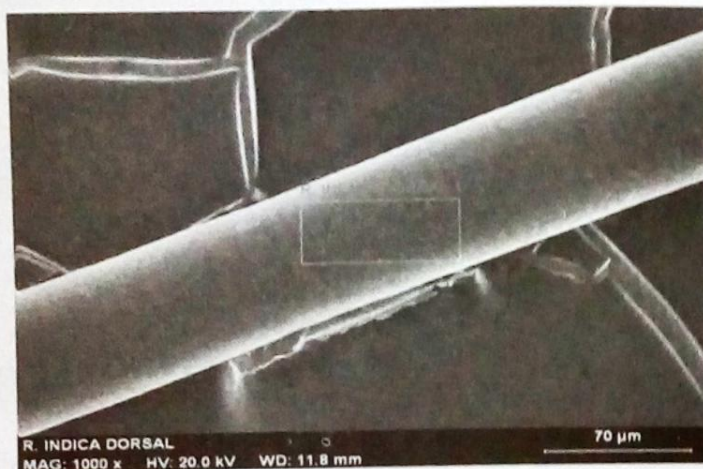


Figure 9. EDX analysis by SEM of dorsal hair of species *Ratuf indica*

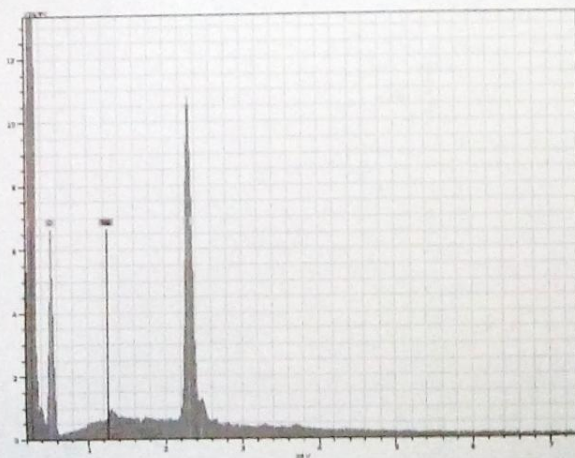


Figure 10. Spectrum of elemental composition of dorsal hair of species *Ratuf indica*

ElAN Series		unn. C	norm. C	Atom. C	Error
		[wt.-%]	[wt.-%]	[at.-%]	[%]
S	16 K-series	7.10	7.10	3.69	0.3
Mg	12 K-series	0.90	0.90	0.62	0.1
C	6 K-series	0.00	0.00	0.00	0.0
O	8 K-series	91.99	91.99	95.69	28.9
Total:		100.00	100.00	100.00	

Table 3. Elemental composition by EDX of dorsal hair of species *Ratuf indica*

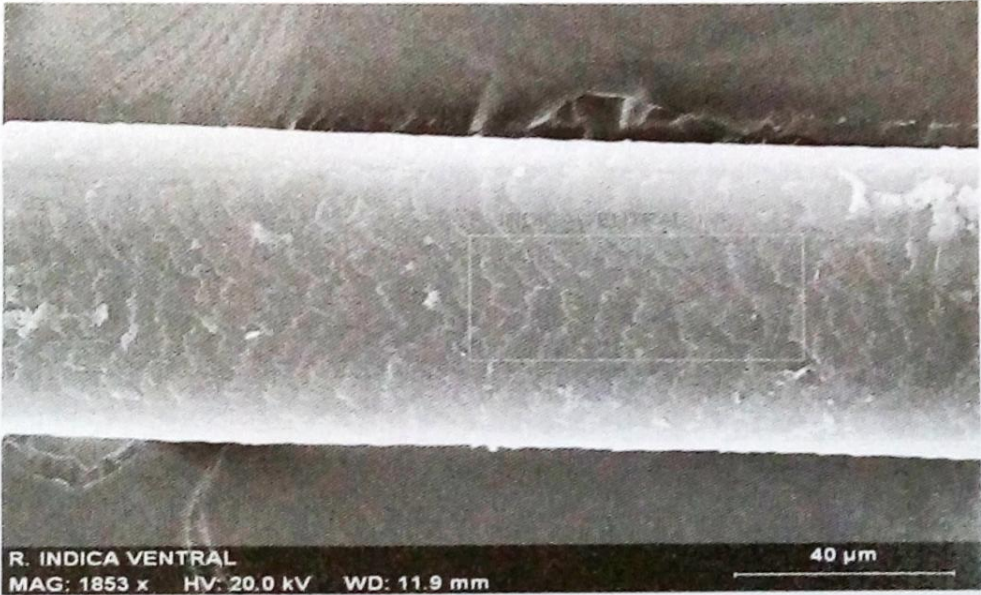


Figure 11. EDX analysis by SEM of ventral hair of species *Ratuf indica*

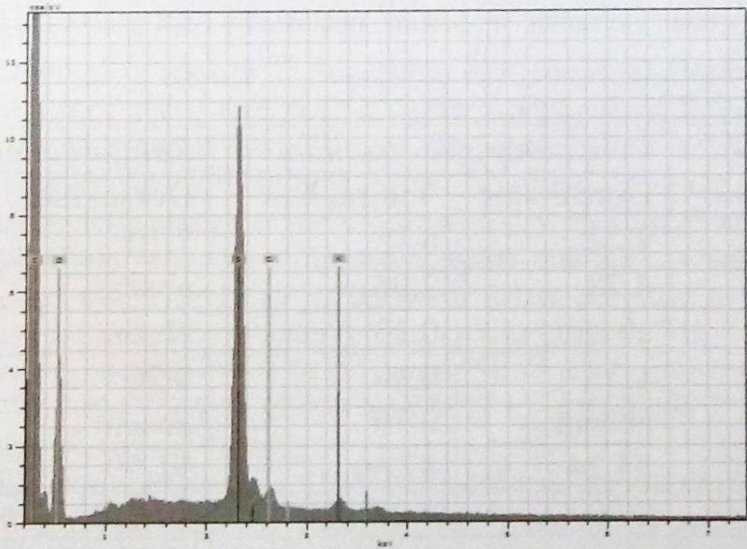


Figure12. Spectrum of elemental composition of ventral hair of species *Ratuf indica*

El AN Series un. C norm. C Atom. C Error
[wt.-%] [wt.-%] [at.-%] [%]

S	16	K-series	8.27	8.27	4.34	0.3
Cl	17	K-series	0.63	0.63	0.30	0.0
K	19	K-series	0.56	0.56	0.24	0.0
C	6	K-series	0.00	0.00	0.00	0.0
O	8	K-series	90.54	90.54	95.13	28.6

Total: 100.00 100.00 100.00

Table 4. Elemental composition by EDX of ventral hair of species *Ratuf indica*

Comparative account of the cuticular structure

Table 5. Cuticular scale pattern of the medial region of squirrel hair.

Name of the species		Scale pattern	Scale margin	Distance between scale	Scale index / cm.
<i>Pentimomys fuscoupillus</i> (Travancore flying squirrel)	Dorsal hair	Regular Wave	Smooth	near	± 0.74
	Ventral hair	Regular Wave	Rippled	near	± 0.95
<i>Ratuf indica</i>	Dorsal hair	Irregular Wave	Smooth	Distant	± 0.37
	Ventral hair	Irregular wave	Rippled	Distant	± 1.33

Table 6. Comparison of elemental composition obtained by EDX analysis of hairs from three species

Element	<i>Pentimomys fuscoupillus</i>		<i>Ratufa indica</i>	
	Dorsal hair	Ventral hair	Dorsal hair	Ventral hair
Sulphur	7.22	8.15	7.10	0.27
Sodium	4.28	2.06	absent	absent
Potassium	absent	0.13	absent	0.56
Magnesium	1.36	0.44	0.90	Absent
Aluminum	absent	0.19	absent	absent
Oxygen	84.24	87.66	91.99	96.54
Chlorine	2.90	1.27	absent	1.63
Silicon	absent	0.09	absent	absent

Discussion:

In tropical countries nearly 250 species of the squirrels are residing globally and very little information is available about their status, distribution and phylogeny. According to Herrer *et al.* (2003), the squirrel family Sciuridae is one of the largest and most widely dispersed families of mammals. The species the families are now on the brink of getting endangered due to extensive deforestation and poaching. The status of *R. indica* and *P. fuscopilus* (members of Sciuridae family) as per the IUCN red list are near threatened. It was reported by Bahuguna and Singh 2013 that the molecular study is one of the very effective tools for identification of the species hence in their conservation.

Scanning electron microscopy has already been used for describing the morphology of hair and of other wildlife parts and products for dealing with wildlife forensic cases (Short 1978). Cuticular scale pattern in dorsal and ventral hairs as depicted in SEM images showed structural differences in scale margins and scale pattern between two species (Table 5) however, the elemental composition provided additional confirmation for differentiating the species as observed in EDX analysis. Previously, Dahiya and Yadav, (2013) reported the Scanning Electron Microscopic characterization and elemental analysis of hair as a tool in identification of Felidae animals. They obtained significant differences in elemental composition of Sodium, Potassium, Calcium and Sulfur by Energy Dispersive Spectrum coupled with SEM.

Similarly, as indicated by EDX analysis there was difference between elemental constituents of hair of both species as given in Table 1b. Differences in percentage of Sulphur in ventral hairs, Chlorine in dorsal hairs, Silicon in ventral hairs, Aluminum and Magnesium in ventral hairs are quite prominent. Sodium present in Travancore flying squirrel but in *R. indica*, it was absent. Silicon was also present in Travancore flying squirrel and absent in hairs of *R. indica* (Figs 5-12, Tables 1-4). In view of the obtained results of distinct elemental composition between two species it can be concluded that SEM along with EDX analysis can be helpful in identification of species at genus level as supplementary data.

SEM micrograph of species *P. fuscopilus* & *R. indica* had an imbricate type of cuticular pattern. When these two species were compared with each other slight difference in their scale pattern was observed. The scale pattern of dorsal hair of *P. fuscopilus* was regular wave with smooth scale margins whereas the scale pattern of ventral hair of the species had regular wave scale pattern with rippled margin. In case of *R. indica*, it was irregular wave with rippled margins and the distance between scale was distant, whereas the ventral hair of the species had irregular scale pattern with rippled margin and the distance between the scales was distant (Table 5, Figs. 1-4). The scale indices were noted to be ± 0.74 for dorsal, ± 0.95 for ventral primary guard hair of *P. fuscopilus*, whereas it was noted to be ± 0.37 for dorsal and ± 1.33 for ventral primary guard hair of *R. indica* (Table 5).

The present study is based on SEM and EDX examination of hair can also be used for identification of species required for wildlife forensic, prey-predator relationship, food habit studies and for wildlife management.

Acquisition of elemental composition along with hair's microscopic structure

may also offer us the ecotoxicological status of niche/habitat of concerned species and identification as well. Hubbart (2012) studied hairs of California ground squirrel (*Spermophilus beecheyi*) as an environmental health bioindicator. Similarly, Ali *et al.* (2014) monitored Mercury exposure using human hairs as bioindicator of environment in Karachi. Such elemental analysis of hairs can also supplement the forensic report containing necropsy, osteology and toxicology data (Bell, 2011). Although, in most of the earlier studies only hair's microscopic morphological features were considered important but in the present study it has been suggested if it is done along with elemental analysis then it will provide a strong scientific proof for the court.

Conclusions: It was concluded that SEM along with EDX analysis can be helpful in identification of species at genus level. However, scale index and the difference in elemental composition could be the strong parameter. The present study is based on SEM and EDX examination of hair as it can be used for identification of species required for wild life forensic, prey-predator relationship, food habit studies and for wildlife management.

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Head water Downstream Diversity and Distribution status of Fishes of Yamuna River System

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INTRODUCTION

The world of today is beginning to recognize the importance of its natural resources, none of which is more critical or more in need of study than its fresh waters. While our water needs are increasing and our need for food from aquatic sources is, likewise, increasing, the usefulness and productivity of rivers, lakes, ponds and streams have decreased by either pollution or abuse.

Fish being a valuable and easily accessible source of food, its pursuit and capture constituting the fisheries, are of great importance. It has been increasingly felt that a thorough knowledge of the fish fauna of an area is a pre-requisite for any study from fisheries point of view and for proper management and rational exploitation of its fishing resources. To obtain the information, the problem has been tackled sincerely in some part of our country. A number of workers associated with educational and scientific institutions engaged themselves in investigating Indian fish fauna on regional basis. A large number of publications dealing with the fish fauna of various parts of our country have appeared in the literature from time to time (Hora & Nair, 1941; Dubey & Mehra, 1962; David, 1963; Dubey & Verma, 1965; Tilak, 1971; Menon, 1974; Misra, 1976 a & b; Mathur & Misra, 1976; Grover & Gupta, 1977; Gupta, 1979; Tilak & Sinha, 1979; Saxena, 1988; Vijay Laxmi *et al.*, 2010; Goswami, 2012; Singh *et. al.* 2013). However, many other regions in India with vast aquatic resources, having peculiar topographical and ecological conditions are still to be investigated for their fish fauna.

Scanning of the major available literature has made it clear that no sustained work has earlier been taken on fish diversity and distribution in Yamuna River. Most of the work has been carried out only on the tributaries of Yamuna River (Singh, 1964; Husain, 1995; Uniyal and Kumar, 2006; Sharma and Mehta, 2008; Lakra, 2010). In the light of the earlier endeavors, the present study was aimed at to bring into light the diversity and distribution of the fishes of Yamuna River system from Himalayan (Yamunotri) to Indo-Gangetic plain regions (Delhi).

MATERIALS AND METHODS

A) STUDTAREA

The river Yamuna from Yamunotri (3293 msl. 31° 1'0.12"N 78° 27'0"E) flows through Himalayan, Sub-Himalayan and Indo-Gangetic plain regions and reach Delhi (216 msl. 28° 36'50"N 77° 12'32"E) covering a distance of about 396 kms. On the basis of accessibility physiography/ topography and altitude, the Himalaya region (R₁) ranged

from Yamunotri to Yamuna bridge (near Kata patthar, Distance=118km. 30° 30'40.0"N 77° 51'42.5"E) Sub-Himalayan region (R_{II}) ranged from Yamuna bridge to Hathnikund barrage (Distance=65km. 30° 19.290'N 77° 02.579'E) Indo-Gangetic Plain region (R_{III}) ranged from Hathnikund barrage to Delhi (Distance=213km.). 9 sampling station were established on the entire length of the river for the collection of fishes. Fig-1

B) COLLECTION OF FISHES

a) Fishing methods and implements: Fishes were collected from different sampling stations/stretches during the study period of March, 2011 to February, 2013. Fish collections were made with the help of local fisherman, the methods ranging from catching by hand to use of different types of nets. Fishing was mostly done by employing 'drag net' or 'surface gill net'. In shallow rivulets and nullahs, it was done by 'Rock fishing. Sometime 'chhipni net' was used which encircles the particular area and the fishes are caught. Gear used in the hill streams and other shallow river were the traps and 'cast nets'.

b) Frequency of Collections: Fishes were collected at least once in a season from various stretches. Besides, visits were also paid to local fish selling spots to procure specimens for the present collection.

c) Preservation of samples: Specimens collected were placed in polythene bags according to their size, not more than two being placed in one bag. These were brought to the laboratory and placed in glass or acrylic jars filled with 8% formalin solution. In a jar specimens were placed in such a way that their tail were pointing upwards. After the fishes were identified, proper labeling of the containers was done.

d) Basis for fish identification: The fishes were identified on the basis of different body ratios, fin counts, number of scales, barbels, general body coloration and morphological characters (Day, 1878; reproduced in 1958 Jayaram, 1981, 1999). The morphometric and meristic characters were taken into account for the identification of different fish species.

C) RELATIVE ABUNDANCE AND DIVERSITY INDICES OF FISH

The diversity indices of fish were carried out at the same sites from the Himalayan Sub-Himalayan region and Indo Gangetic Plain of Yamuna river. The total number of individual falls under a species and the total number of species observed were recorded. The various indices of diversity were calculated as follows:

a) Index of dominance: The index of dominance is calculated as per Simpson (1949) using formula:

$$C = \sum (n_i/N)^2$$

Where, n_i = Number of individuals in the 'i' the species and N = Total number of individuals.

b) Index of species richness: The index of species richness or variety of species (d_i) is determined using the formula (Margalef, 1968):

$$d_i = S - 1 / \ln N$$

Where, S = Total number of species, N = total number of individuals.

c) Index of diversity: The diversity is calculated according to Shannon- Wiener index (Shannon- Wiener, 1963).

$$H' = - \sum (n_i / N) \log_2 (n_i / N)$$

Where, H' = Diversity of species. n_i = Number of individuals in the 'i' the species, N = Total number of individuals of all species and S = Total number of species collected.

d) Index of evenness: Index of evenness (e) is quantified on the basis of the formula (Pielou, 1966):

$$E = H' / \ln S$$

Where, H' = Shannon- Wiener index, S = Total number of species

e) Relative Abundance: The relative abundance (RA) of individual fish species was calculated by following formula.

$$RA = \frac{\text{Number of samples of particular species}}{\text{Total Number of samples}} \times 100$$

D) WATER QUALITY ANALYSIS :

The physical and chemical characteristics of water were analysed by following standard methods for the examination of water and waste water APHA (1998) and Trivedi and Goyal (1986). Most of the analysis were completed within five hours of sample collection except for those parameters for which the samples had to be kept for further analysis. The water current was measured by float method. The depth was measured by metre scale and at some places through measured bamboo pole. **Yamunotri Barkot Yamunabridge Tons river Paontasahib Hathanikund barrage Bidauli Bagpat Delhi Western Yamuna Canal Eastern Yamuna Canal Yamunariver Palla** The habitat categorization method was followed as per Bain and Stevenson, 1999 (vide Lakra *et. al.* 2010

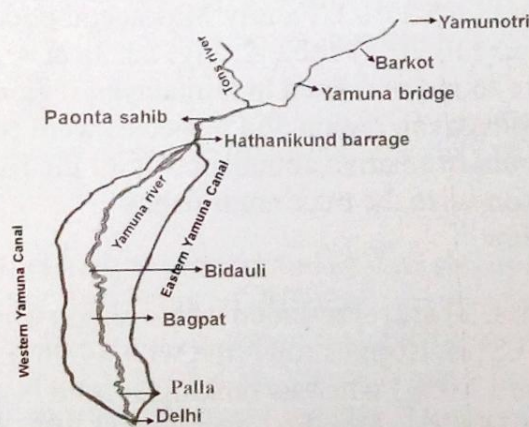


Fig. 1 Study area showing major sampling stations

OBSERVATIONS

A) Overall Assessment of Fish species diversity, abundance and distribution

A total number of 2129 individuals belonging to 65 species, 43 genera, 19 families and 7 orders collected from all the three regions were examined and presented in the form of check-list. Table-1

Percentage-wise abundance of different orders and representative families under them is shown in Table 2 Fig. 2 & 3 Order Osteoglossiformes 1.24%. (Family: Notopteridae 1.24%) , Order Clupeiformes 0.31%. (Family: Engraulidae 0.31%), Order Cypriniformes 59.94% (Families: Cyprinidae 55.08%, Cobitidae 1.53%, Balitoridae 3.33%), Order Siluriformes 33.25% (Families: Sisoridae 2.76%, Siluridae 6.54%, Claridae 4.73%, Heteropneustidae 3.50%, Schilbidae 4.67%, Pangasidae 0.47%, Bagridae 10.58%), Order Beloniformes 3.90% (Family: Belonidae 3.90%), Order Synbranchiformes 9.71% (Family: Mastacembelidae 9.71%) and Order Perciformes 18.61% (Families: Ambassidae 0.62%, Nandidae 2.80%, Gobiidae 1.09%, Osphronemiidae 2.69% and Channidae 11.41%).

B) Regionwise assessment of fish species diversity, abundance and distribution

Himalayan Region

Himalayan region is mainly represented by hill stream fishes except *Mastacembelus armatus* which is frequent in all three regions. Out of total 65 species, 16 are represented in this region which constitute about 24.6% of the total fish fauna. Order Cypriniformes is represented by the largest number of species 89.74 % (Families: Cyprinidae 84.10%, Cobitidae 2.31% and Balitoridae 3.33%) followed by order Synbranchiformes 10.26%. (Family: Mastacembelidae 10.26%). Cyprinids which form the major percentage of the faunal composition most frequently comprise of *Barilius bendelisis* (14.87%) , *Schizothorax richardsonii* (13.59%) , *Barilius vagra* (11.28%). Other Cyprinids form lesser percent composition. Among Cobitids *Lepidocephalichthys guntea* (2.31%) and order Synbranchiformes (10.26%). Family Mastacembelidae is represented by *Mastacembelus armatus* (10.26%) Table-2, Fig. 2a, 3a & 4. In this region out of 16 species, 9 species were found restricted to Himalayan region, 2 species were found in Himalayan and Sub Himalayan region and 5 species were collected from all the three regions. Detailed account of relative abundance of all the fishes found in this region is given in Table-3. Season-wise the maximum fishes

Sub Himalayan Region

Out of 65 species, 33 are represented in this region which constitute about 50.76 % of total fish fauna Order Cypriniformes runs first with 44.96% (Family : Cyprinidae 43.86% and Family : Cobitidae 1.10%) whereas ranking second is the Order Perciformes 20.69% (Family : Channidae 14.09%, Family : Nandidae 3.96% and Family : Osphronemiidae 2.64%). Next in order of abundance, come Orders Siluriformes 18.93% (Family : Bagridae

6.38%, Family : Clariidae 5.95%, Family : Heteropneustidae 3.96% and Family : Sisoridae 2.64%), Order Synbranchiformes 11.01% (Family : Mastacembelidae 11.01% and Order Beloniformes 5.51% (Family : Belonidae 5.51%). Table-2, Fig. 2b, 3b & 4.

The most abundant species are *Mastacembelus armatus* (7.93%) followed by *Channa punctatus* (7.05%), *Clarias batrachus* (5.95%), *Belone cancila* (5.51%). The abundance of rest of the fish species was found below 5%. Table 5. Maximum fishes were collected in summer (206), winter (167) and rainy (81). Table-6.

In Sub-Himalayan region out of 33 species, 3 species were found restricted to this region whereas 2 species were found in Himalayan and Sub-Himalayan regions, 23 species in Sub-Himalayan and Indo-Gangetic Plain regions and 5 species were collected from all the three regions.

Indo-Gangetic Plain Region

This region is represented by 51 species of fishes belonging to 7 orders and 18 families except Balitoridae and constitute about 78.46% of the total fish fauna. Order Cypriniformes stands first in this region also with 38.44% (Family: Cyprinidae 37.27% and Cobitidae 1.17%). Whereas ranking second is the Order Siluriformes 35.87% Family : Bagridae 14.77%, Family : Siluridae 6.54%, Family : Schiebeidae 4.67%, (Family : Clariidae 3.50%, Family : Heteropneustidae 3.04%, Family : Sisoridae 2.88% and Family : Pangasiidae 0.47%) next in order of abundance come Orders Perciformes 14.80% (Family : Channidae 8.72%, Family : Osphronemiidae 2.73%, Family : Nandidae 1.64%, Family : Gobiidae 1.09% and Family : Ambassidae 0.62%. Order Synbranchiformes 7.86% (Family : Mastacembelidae 7.86%) , Order Beloniformes 2.20% (Family : Belonidae 2.20%), Order Osteoglossiformes 1.24% (Family : Notopteridae 1.24%) and Order Clupeiformes 0.31% (Family : Engraulidae 0.31%). Table 2. Fig. 2c, 3c & 4.

The most abundant species are *Mastacembelus armatus* (4.98%), *Catla catla* (4.36%) and *Labeo rohita* (4.28%). Minimum abundance was shown by *Notopterus chitala* and *N. notopterus* (each with 0.62%), *Badis badis* and *Clupisoma garua* (each with 0.39%) and *Setipinna phasa* and *Glyprothorax pectinopterus* each with (0.31%). Detailed account of relative abundance and seasonal diversity of all the fishes found in this region is given in Table-7 & 8.

Analysis of the composition as represented by data shows that this region affords varied kind of habitats for the well being of different varieties and sizes of fishes. The increase in percentage composition in this region may be due to addition of Clupeoids, notopterids, major carps, large sized cat fishes, channids and a good number of percoids which can make an easy movement from lower reaches. This also explains why in upper reaches i.e. Himalayan and Sub-Himalayan regions only specially adapted hill stream fishes or small minnows and carps are established and large sized fishes are absent.

In this region out of 51 species, 23 species were found restricted to Indo-Gangetic Plain whereas 23 other species were found in both Sub-Himalayan and Indo-Gangetic Plain regions and 5 species showed long range migration from Himalayan through Sub-Himalayan region to Indo-Gangetic plain region. Region wise seasonal diversity indices of fishes has been given in Table-9.

Water Analysis

Physico Chemical Parameters varied considerably region wise as well as season wise as presented in Table 10. The Water Depth varied from region to region i.e. 1.2m (R_I) & 4.9m (R_{III}) In rainy season it was more and could not be measured.

DISCUSSION

The description in the fore going pages summarizes authors observations on the "Head Water Downstream Diversity and Distribution Status of Fishes of Yamuna River System". A total number of 2129 individuals belonging to 65 species, 43 genera, 19 families and 7 orders collected from all the three regions were examined during the course of present investigations i.e. from March 2011 to Feb. 2013.

It is an established fact that the species richness, diversity and abundance increases rapidly or steadily from upstream to downstream sections almost entirely with the result of addition of new species and little replacement of the upstream fauna (Welcome, 1985; Bayley and Li, 1994; Granado, 2000). Lowe McConnell (1975) attributed greater downstream diversity to the greater downstream importance of detritus and plankton, producing greater diversity of higher trophic levels. Lotrich (1973) related the richness and trophic structure of stream fish communities to the head water downstream shift from allochthony to autochthony, towards increasing amount of detritus and towards finer sizes of detritus. The study has simultaneously revealed that head waters are postulated to be temporarily more variable than downstream sections, as a result the diversity being the lowest in the most variable head waters than the constant downstream sections (Horwitz, 1978). Our findings are completely in agreement with these authors as the head water downstream diversity and distribution in best expressed by river Yamuna where number of species are steadily increased (Himalayan region 16 Sp., Sub Himalayan region 33 sp. and Indo-Gangetic plain region 51 sp.) up to downstream plain conditions. The possibility of lateral replacement rate which increases with the increase in basin sizes corroborates the findings of Pflieger (1971). However, Habit *et al.*, 2006 and Lakra *et al.*, 2010 are of the opinion that species diversity, species richness both were lowered in the lower area compared with the upper area.

From the percentage wise abundance (Table 2) of different orders and families it is evident that the cyprinids dominate the fish fauna (59.94%), a feature almost uniform in the observations of other workers (Jayaram, 1981; Saxena, 1988; Srivastava, 1988; Bhat, 2003; Uniyal & Kumar, 2006; Sharma & Mehta, 2008; Vijaylaxmi *et al.*, 2010; Lakra *et al.*, 2010) from other parts of India.

Out of 65 species, 9 species in Himalayan region, 3 species in sub Himalayan region and 23 species in Indo-Gangetic plain region were found restricted in their respective regions and may be regarded as resident species.

5 species viz. *Aspidoparia morar*, *Tor putitora*, *Tor tor*, *Lepidocephalichthys guntea* and *Mastacembelus armatus* showed long range migration as these fishes were collected round the year from all the three regions.

2 species i.e. *Schizothoracichthys* and *Labeo dero* were seen migrating between Himalayan and Sub Himalayan regions while 23 species migrate to and fro between Sub Himalayan and Indo-Gangetic plain regions. It is evident that Sub Himalayan region exhibits admixture of fishes of Himalayan and Indo-Gangetic plain regions. Such type of mixing up of fish fauna was also observed by Uniyal and Kumar, 2006. They have reported *Nandus nandus* and *Colisa fasciatus* from Dehradun valley whereas we have collected these fishes from lower reaches of Sub Himalayan regions.

During the course of present study, 8 types of fish habitats have been identified along the entire length of the river in Himalayan, Sub Himalayan and Indo-Gangetic plain region: open river (n=32), slow water (n=28), deep pools (n=21), scour pool (n=12), channel confluences (n=11), shallow water (n=10), riffle (n=8) and fast water (n=5). The number in parentheses shows fish species richness in descending order in each habitat. Open river, slow water and deep pools found suitable house for cyprinids, silurids, notopterids and clupeids. Fast water and riffles habitat support very low fish species richness i.e. only hill stream fishes thrive well. Moderate fish species richness was observed in scour pools and channel confluences. Open River, slow water and deep pools habitats with microphytes plays an important role. In fish assemblage and aggregation (Gowns *et al.*, 2003; Raghvan *et al.*, 2008) and were the most preferred habitat for fishes in habitat in the tropical rivers (Lobb and Orth, 1991; Aadland, 1993; Arunachalam, 2000; Sarkar *et al.*, 2010; Lakra *et al.*, 2010). Our findings also support the views of above authors.

Present study revealed that water temperature, pH, dissolved oxygen, water depth, total solids and conductivity were found responsible for shaping the fish diversity and distribution. Fast water current (Himalayan region) had negative impact on total number of fish species, while depth showed positive effects. The reason of low species richness in Himalayan regions may be due to water current which has indirect influence on fish fauna by modifying water temperature, gaseous contents and various other biotic and abiotic conditions. Present observations are in agreement with the findings of Uniyal and Kumar, 2006 and Lakra *et al.*, 2010.

Habitat loss and environmental degradation (mining pollution etc.) has seriously affected the diversity and distribution of fishes of Yamuna river system. Conservation of fish diversity assumes top most priority under prevailing circumstances of gradual habitat degradation. There is a need for survey of diversity of fish fauna in different types of habitats all over the country. The present investigations will provide future strategies for fish conservation and environmental bioassessment.

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Table-1 : A Checklist of fishes and their numbers collected from three regions of river Yamuna during March 2011- February 2013 (Fishes have been classified and arranged as per Nelson, 2006)

S.No	Name of Fish	Regions		
		R _I	R _{II}	R _{III}
Order- Osteoglossiformes				
Family- Notopteridae				
1.	<i>Notopterus chitala</i> (Hamilton-Buchanan)			8
2.	<i>Notopterus notopterus</i> (Pallas)			8
Order- Clupeiformes				
Family- Engraulidae				
3.	<i>Setipinna phasa</i> (Hemilton)			4
Order – Cypriniformes				
Family- Cyprinidae				
4.	<i>Puntius conchonius</i> (Hamilton-Buchanan)		18	7
5.	<i>Puntius chola</i> (Hamilton-Buchanan)		15	17
6.	<i>Puntius sarana</i> (Hamilton-Buchanan)		14	26
7.	<i>Puntius sophore</i> (Hamilton-Buchanan)		6	15
8.	<i>Puntius ticto</i> (Hamilton-Buchanan)		11	22
9.	<i>Schizothorax richardsonii</i> (Hamilton-Buchanan)	53		
10.	<i>Schizothoracithys</i> (Misra)	9	14	
11.	<i>Chagunius chagunio</i> (Hamilton-Buchanan)		13	
12.	<i>Labeo bata</i> (Hamilton-Buchanan)			32
13.	<i>Labeo calbasu</i> (Hamilton-Buchanan)			15
14.	<i>Labeo dyocheilus</i> (Mc Clelland)		8	18
15.	<i>Labeo gonius</i> (Hamilton-Buchanan)			12
16.	<i>Labeo pangusia</i> (Hamilton-Buchanan)		6	26
17.	<i>Labeo rohita</i> (Hamilton-Buchanan)		15	55
18.	<i>Labeo dero</i> (Hamilton-Buchanan)	6	8	

19.	<i>Aspidoparia morar</i> (Hamilton-Buchanan)	7	5	26
20.	<i>Barilius barna</i> (Hamilton-Buchanan)	27		
21.	<i>Barilius bendelisis</i> (Hamilton-Buchanan)	58		
22.	<i>Barilius vagra</i> (Hamilton-Buchanan)	44		
23.	<i>Barilius shacra</i> (Hamilton-Buchanan)	9		
24.	<i>Chela bacaila</i> (Hamilton)		8	
25.	<i>Danio rario</i> (Hailton)		5	
26.	<i>Rasbora daniconius</i> (Hamilton-Buchanan)		10	25
27.	<i>Raiamas bola</i> (Hamilton-Buchanan)	21		
28.	<i>Cirrhinus mrigala</i> (Hamilton-Buchanan)			51
29.	<i>Cirrhinus reba</i> (Hamilton-Buchanan)			18
30.	<i>Crossocheilus latius latius</i> (Hamilton-Buchanan)		12	21
31.	<i>Catla catla</i> (Hamilton-Buchanan)			56
32.	<i>Garra gotyla gotyla</i> (Gray)	32		
33.	<i>Tor chelynoidea</i> (Hamilton-Buchanan)	12		
34.	<i>Tor putitora</i> (Hamilton-Buchanan)	25	19	21
35.	<i>Tor tor</i> (Hamilton-Buchanan)	25	12	10
Family- Cobitidae				
36.	<i>Lepidocephalichthys guntea</i> (Hamilton-Buchanan)	9	5	15
Family- Balitoridae				
37.	<i>Schistura rupecola</i> (Hamilton)	13		
Order- Siluriformes				
Family- Sisoridae				
38.	<i>Bagarius bagarius</i> (Hamilton-Buchanan)			33
39.	<i>Glyptothorax pectinopterus</i> (Hamilton)		7	4

Family- Siluridae				
40.	<i>Ompok pabda</i> (Hamilton-Buchanan)			26
41.	<i>Ompok bimaculatus</i> (Bloch)			34
42.	<i>Wallago attu</i> (Bloch and Schneider)			24
Family- Clariidae				
43.	<i>Clarias batrachus</i> (Linnaeus)		27	45
Family- Heteropneustidae				
44.	<i>Heteropneustes fossilis</i> (Bloch)		18	39
Family- Schilbeidae				
45.	<i>Clupisoma garua</i> (Hamilton-Buchanan)			5
46.	<i>Eutropichthys vacha</i> (Hamilton-Buchanan)			41
47.	<i>Silonia silondia</i> (Hamilton-Buchanan)			14
Family- Pangasiidae				
48.	<i>Pangasius pangasius</i> (Hamilton)			6
Family- Bagridae				
49.	<i>Mystus bleekeri</i> (Day)		11	30
50.	<i>Mystus cavasius</i> (Hamilton-Buchanan)			42
51.	<i>Mystus aor</i> (Hamilton-Buchanan)			14
52.	<i>Mystus seenghala</i> (Sykes)			41
53.	<i>Mystus vittatus</i> (Bloch)		18	39
54.	<i>Rita rita</i> (Hamilton-Buchanan)			23
Order- Beloniformes				
Family- Belonidae				
55.	<i>Belone cancila</i> (Hamilton-Buchanan)		25	26
Order- Synbranchiformes				
Family- Mastacembelidae				

Order- Synbranchiformes				
Family- Mastacembelidae				
56.	<i>Macrognathus pancalus</i> (Hamilton-Buchanan)		14	37
57.	<i>Mastacembalus armatus</i> (Lacepede)	40	36	64
Order- Perciformes				
Family- Ambassidae				
58.	<i>Ambasis ranga</i> (Hamilton-Buchanan)			8
Family- Nandidae				
59.	<i>Nandus nandus</i> (Hamilton-Buchanan)		9	16
60.	<i>Badis badis</i> (Hamilton)		9	5
Family- Gobiidae				
61.	<i>Glossogobius giuris</i> (Hamilton-Buchanan)			14
Family- Osphronemiidae				
62.	<i>Colisa fasciatus</i> (Bloch & Schneider)		12	35
Family – Channidae				
63.	<i>Channa gachua</i> (Bloch)		17	38
64.	<i>Channa marulius</i> (Hamilton-Buchanan)		15	35
65.	<i>Channa punctatus</i> (Bloch)		32	39

Table-2 : Percentage-wise abundance of different orders and represented families of fish species in different regions

Order	Family	Regions (Abundance %)			Total %	
		R _I	R _{II}	R _{III}	Family (Average%)	Order
Osteoglossiformes	Notopteridae	-	-	1.24	1.24	1.24
Clupeiformes	Engraulidae	-	-	0.31	0.31	0.31
Cypriniformes	Cyprinidae	84.10	43.86	37.27	55.08	59.94
	Cobitidae	2.31	1.10	1.17	1.53	
	Balitoridae	3.33	-	-	3.33	
Siluriformes	Sisoridae	-	2.64	2.88	2.76	33.25
	Siluridae	-	-	6.54	6.54	
	Clariidae	-	5.95	3.50	4.73	
	Heteropneustidae	-	3.96	3.04	3.50	
	Schilbeidae	-	-	4.67	4.67	
	Pangasiidae	-	-	0.47	0.47	
	Bagridae	-	6.38	14.77	10.58	
Beloniformes	Belonidae	-	5.51	2.20	3.90	3.90
Synbranchiformes	Mastacembelidae	10.26	11.01	7.86	9.71	9.71
Perciformes	Ambassidae	-	-	0.62	0.62	18.61
	Nandidae	-	3.96	1.64	2.80	
	Gobiidae			1.09	1.09	
	Osphronemiidae	-	2.64	2.73	2.69	
	Channidae	-	14.09	8.72	11.41	

Table -3 Relative abundance of fishes examined in Himalayan region

S.No	Name of Fish	No. of fishes examined			Abundance (%)
		Male	Female	Total	
1.	<i>Schizothorax richardsonii</i>	21	32	53	13.59
2.	<i>Schizothoraithys</i>	3	6	9	2.31
3.	<i>Labeo dero</i>	3	3	6	1.54
4.	<i>Aspidoparia morar</i>	3	4	7	1.79
5.	<i>Barilius barna</i>	18	9	27	6.92
6.	<i>Barilius bendelisis</i>	24	34	58	14.87
7.	<i>Barilius vagra</i>	16	28	44	11.28
8.	<i>Barilius shacra</i>	3	6	9	2.31
9.	<i>Raiamas bola</i>	12	9	21	5.38
10.	<i>Garra gotyla gotyla</i>	13	19	32	8.21
11.	<i>Tor chelynoides</i>	4	8	12	3.08
12.	<i>Tor putitora</i>	9	16	25	6.41
13.	<i>Tor tor</i>	13	12	25	6.41
14.	<i>Lepidocephalichthyes guntea</i>	6	3	9	2.31
15.	<i>Schistura rupecola</i>	5	8	13	3.33
16.	<i>Mastacembalus armatus</i>	17	23	40	10.26
Total		170	220	390	

Table -4 Seasonal diversity of fishes in Himalayan region

S.No	Name of Fish	Seasons		
		Summer	Rainy	Winter
1.	<i>Schizothorax richardsonii</i>	22	12	19
2.	<i>Schizothoraithys</i>	5	1	3
3.	<i>Labeo dero</i>	4	0	2
4.	<i>Aspidoparia morar</i>	3	2	2
5.	<i>Barilius barna</i>	13	4	10
6.	<i>Barilius bendelisis</i>	26	13	19
7.	<i>Barilius vagra</i>	19	9	16
8.	<i>Barilius shacra</i>	5	1	3
9.	<i>Raiamas bola</i>	11	4	6
10.	<i>Garra gotyla gotyla</i>	15	6	11
11.	<i>Tor chelynoides</i>	4	2	6
12.	<i>Tor putitora</i>	12	6	7
13.	<i>Tor tor</i>	15	2	8
14.	<i>Lepidocephalichthyes guntea</i>	3	2	4
15.	<i>Schistura rupecola</i>	7	2	4
16.	<i>Mastacembalus armatus</i>	16	7	17
Total		180	73	137

Table -5. Relative abundance of fishes examined in Sub-Himalayan region

S.No	Name of Fish	No. of fishes examined			Abundance (%)
		Male	Female	Total	
1.	<i>Puntius conchoni</i>	11	7	18	3.96
2.	<i>Puntius chola</i>	10	5	15	3.30
3.	<i>Puntius sarana</i>	7	7	14	3.08
4.	<i>Puntius sophore</i>	2	4	6	1.32
5.	<i>Puntius ticto</i>	8	3	11	2.42
6.	<i>Schizothoracichthys</i>	5	9	14	3.08
7.	<i>Chagunius chagunio</i>	7	6	13	2.86
8.	<i>Labeo dyocheilus</i>	2	6	8	1.76
9.	<i>Labeo pangusia</i>	1	5	6	1.32
10.	<i>Labeo rohita</i>	6	9	15	3.30
11.	<i>Labeo dero</i>	2	6	8	1.76
12.	<i>Aspidoparia morar</i>	2	3	5	1.10
13.	<i>Chela bacaila</i>	3	5	8	1.76
14.	<i>Danio rario</i>	3	2	5	1.10
15.	<i>Rasbora daniconius</i>	3	7	10	2.20
16.	<i>Crossocheilus latius latius</i>	4	8	12	2.64
17.	<i>Tor putitora</i>	11	8	19	4.19
18.	<i>Tor tor</i>	5	7	12	2.64
19.	<i>Lepidocephalichthys guntea</i>	2	3	5	1.10
20.	<i>Glyptothorax pectinopterus</i>	2	5	7	1.54
21.	<i>Clarias batrachus</i>	15	12	27	5.95
22.	<i>Heteropneustes fossilis</i>	7	11	18	3.96
23.	<i>Mystus bleekeri</i>	4	7	11	2.42
24.	<i>Mystus vittatus</i>	10	8	18	3.96
25.	<i>Belone cancila</i>	11	14	25	5.51
26.	<i>Macrognathus pancalus</i>	5	9	14	3.08
27.	<i>Mastacembalus armatus</i>	16	20	36	7.93
28.	<i>Nandus nandus</i>	3	6	9	1.98
29.	<i>Badis badis</i>	4	5	9	1.98
30.	<i>Colisa fasciatus</i>	5	7	12	2.64
31.	<i>Channa gachua</i>	8	9	17	3.74
32.	<i>Channa marulius</i>	9	6	15	3.30
33.	<i>Channa punctatus</i>	14	18	32	7.05
Total		207	247	454	

Table -6 Seasonal diversity of fishes in Sub-Himalayan region

S.No	Name of Fish	Seasons		
		Summer	Rainy	Winter
1.	<i>Puntius conchoni</i>	5	2	11
2.	<i>Puntius chola</i>	9	1	5
3.	<i>Puntius sarana</i>	8	1	5
4.	<i>Puntius sophore</i>	3	0	3
5.	<i>Puntius ticto</i>	6	1	4
6.	<i>Schizothoracichthys</i>	6	2	6
7.	<i>Chagunius chagunio</i>	7	1	5
8.	<i>Labeo dyocheilus</i>	3	0	5
9.	<i>Labeo pangusia</i>	2	1	3
10.	<i>Labeo rohita</i>	10	1	4
11.	<i>Labeo dero</i>	4	2	2
12.	<i>Aspidoparia morar</i>	0	2	3
13.	<i>Chela bacaila</i>	2	2	4
14.	<i>Danio rario</i>	3	2	0
15.	<i>Rasbora daniconius</i>	5	2	3
16.	<i>Crossocheilus latius latius</i>	5	3	4
17.	<i>Tor putitora</i>	10	0	9
18.	<i>Tor tor</i>	3	4	5
19.	<i>Lepidocephalichthys guntea</i>	2	1	2
20.	<i>Glyptothorax pectinopterus</i>	3	3	1
21.	<i>Clarias batrachus</i>	13	5	9
22.	<i>Heteropneustes fossilis</i>	8	3	7
23.	<i>Mystus bleekeri</i>	5	2	4
24.	<i>Mystus vittatus</i>	7	3	8
25.	<i>Belone cancellata</i>	11	6	8
26.	<i>Macrognathus pancalus</i>	4	3	7
27.	<i>Mastacembalus armatus</i>	16	11	9
28.	<i>Nandus nandus</i>	2	2	5
29.	<i>Badis badis</i>	6	1	2
30.	<i>Colisa fasciatus</i>	7	2	3
31.	<i>Channa gachua</i>	9	3	5
32.	<i>Channa marulius</i>	6	4	5
33.	<i>Channa punctatus</i>	16	5	11
	Total	206	81	167

Table-7. Relative abundance of fishes examined in Indo-Gangetic plain region

S.No	Name of Fish	No. of fishes examined			Abundance (%)
		Male	Female	Total	
1.	<i>Notopterus chitala</i>	3	5	8	0.62
2.	<i>Notopterus notopterus</i>	5	3	8	0.62
3.	<i>Setipinna phasa</i>	1	3	4	0.31
4.	<i>Puntius conchoni</i>	3	4	7	0.55
5.	<i>Puntius chola</i>	11	6	17	1.32
6.	<i>Puntius sarana</i>	8	18	26	2.02
7.	<i>Puntius sophore</i>	5	10	15	1.17
8.	<i>Puntius ticto</i>	8	14	22	1.71
9.	<i>Labeo bata</i>	18	14	32	2.94
10.	<i>Labeo calbasu</i>	3	12	15	1.17
11.	<i>Labeo dyocheilus</i>	8	10	18	1.40
12.	<i>Labeo gonius</i>	2	10	12	0.93
13.	<i>Labeo pangusia</i>	7	19	26	2.02
14.	<i>Labeo rohita</i>	27	28	55	4.28
15.	<i>Aspidoparia morar</i>	18	8	26	2.02
16.	<i>Rasbora daniconius</i>	12	13	25	1.95
17.	<i>Cirrhinus mrigala</i>	25	26	51	3.97
18.	<i>Cirrhinus reba</i>	7	11	18	1.40
19.	<i>Crossocheilus latius latius</i>	9	12	21	1.64
20.	<i>Catla catla</i>	25	31	56	4.36
21.	<i>Tor putitora</i>	9	12	21	1.64
22.	<i>Tor tor</i>	6	4	10	0.78
23.	<i>Lepidocephalichthys guntea</i>	5	10	15	1.17
24.	<i>Bagarius bagarius</i>	16	17	33	2.57
25.	<i>Glyptothorax pectinopterus</i>	2	2	4	0.31
26.	<i>Ompok pabda</i>	13	13	26	2.02
27.	<i>Ompok bimaculatus</i>	16	18	34	2.65
28.	<i>Wallago attu</i>	9	15	24	1.87
29.	<i>Clarias batrachus</i>	21	24	45	3.50

30.	<i>Heteropneustes fossilis</i>	19	20	39	3.04
31.	<i>Chupisoma garua</i>	1	4	5	0.39
32.	<i>Eutropichthys vacha</i>	17	24	41	3.19
33.	<i>Silonia silondia</i>	6	8	14	1.09
34.	<i>Pangasius pangasius</i>	2	4	6	0.47
35.	<i>Mystus bleekeri</i>	15	15	30	2.34
36.	<i>Mystus cavasius</i>	20	22	42	3.27
37.	<i>Mystus aor</i>	4	10	14	1.09
38.	<i>Mystus seenghala</i>	16	25	41	3.19
39.	<i>Mystus vittatus</i>	19	20	39	3.09
40.	<i>Rita rita</i>	11	12	23	1.79
41.	<i>Belone cancila</i>	8	18	26	2.02
42.	<i>Macrognathus pancalus</i>	14	23	37	2.88
43.	<i>Mastacembalus armatus</i>	25	39	64	4.98
44.	<i>Ambasis nama</i>	3	5	8	0.62
45.	<i>Nandus nandus</i>	7	9	16	1.25
46.	<i>Badis badis</i>	2	3	5	0.39
47.	<i>Glossogobius giuris</i>	5	9	14	1.09
48.	<i>Colisa fasciatus</i>	23	12	35	2.73
49.	<i>Channa gachua</i>	15	23	38	2.96
50.	<i>Channa marulius</i>	15	20	35	2.73
51.	<i>Channa punctatus</i>	19	20	39	3.04
	Total	568	717	1285	

Table-8 Seasonal diversity of fishes in Indo-Gangetic plain region

S.No	Name of Fish	Seasons		
		Summer	Rainy	Winter
1.	<i>Notopterus chitala</i>	4	2	2
2.	<i>Notopterus notopterus</i>	3	3	2
3.	<i>Setipinna phasa</i>	3	0	1
4.	<i>Puntius conchoni</i>	5	2	0
5.	<i>Puntius chola</i>	9	2	6
6.	<i>Puntius sarana</i>	13	5	8
7.	<i>Puntius sophore</i>	5	3	7
8.	<i>Puntius ticto</i>	12	5	5
9.	<i>Labeo bata</i>	16	6	10
10.	<i>Labeo calbasu</i>	7	3	5
11.	<i>Labeo dyocheilus</i>	10	2	6
12.	<i>Labeo gonius</i>	6	2	4
13.	<i>Labeo pangusia</i>	11	5	10
14.	<i>Labeo rohita</i>	25	12	18
15.	<i>Aspidoparia morar</i>	14	5	7
16.	<i>Rasbora daniconius</i>	13	3	9
17.	<i>Cirrhinus mrigala</i>	32	8	11
18.	<i>Cirrhinus reba</i>	6	4	8
19.	<i>Crossocheilus latius latius</i>	12	0	9
20.	<i>Catla catla</i>	23	13	20
21.	<i>Tor putitora</i>	11	3	7
22.	<i>Tor tor</i>	8	0	2
23.	<i>Lepidocephalichthys guntea</i>	7	2	6
24.	<i>Bagarius bagarius</i>	15	7	11
25.	<i>Glyptothorax telchitta</i>	4	0	0
26.	<i>Ompok pabda</i>	16	4	6
27.	<i>Ompok bimaculatus</i>	17	5	12
28.	<i>Wallago attu</i>	13	3	8
29.	<i>Clarias batrachus</i>	24	13	8
30.	<i>Heteropneustes fossilis</i>	19	6	14
31.	<i>Clupisoma garua</i>	3	2	0

32.	<i>Eutropichthys vacha</i>	25	6	10
33.	<i>Silonia silondia</i>	9	0	5
34.	<i>Pangasius pangasius</i>	0	2	4
35.	<i>Mystus bleekeri</i>	17	5	8
36.	<i>Mystus cavasius</i>	19	9	14
37.	<i>Mystus aor</i>	5	3	6
38.	<i>Mystus seenghala</i>	23	7	11
39.	<i>Mystus vittatus</i>	18	8	13
40.	<i>Rita rita</i>	8	6	9
41.	<i>Belone cancila</i>	11	5	10
42.	<i>Macrognathus pancalus</i>	14	4	19
43.	<i>Mastacembalus armatus</i>	29	12	23
44.	<i>Ambasis nama</i>	5	0	3
45.	<i>Nandus nandus</i>	9	2	5
46.	<i>Badis badis</i>	3	2	0
47.	<i>Glossogobius giuris</i>	10	0	4
48.	<i>Colisa fasciatus</i>	19	7	9
49.	<i>Channa gachua</i>	21	3	14
50.	<i>Channa marulius</i>	18	12	5
51.	<i>Channa punctatus</i>	21	7	11
Total		650	230	405

Table 9 Seasonal diversity indices of fish fauna in different regions

Regions of Yamuna river	Seasons	No. of species (S)	Index of species richness (d_1)	Index of dominance (c)	Index of evenness (e)	Index of species diversity (H')
R_I	Summer	16	2.8885	0.0816	0.9288	2.5752
	Rainy	15	3.2631	0.0944	0.8959	2.4263
	Winter	16	3.0488	0.0856	0.9162	2.5402
R_{II}	Summer	32	5.8184	0.0372	0.9539	3.3061
	Rainy	30	6.5993	0.0401	0.9365	3.1852
	Winter	32	6.0571	0.0331	0.9652	3.3450
R_{III}	Summer	50	7.5652	0.0249	0.9588	3.7508
	Rainy	44	7.9072	0.0270	0.9546	3.6125
	Winter	47	7.6617	0.0254	0.9612	3.7006

Table 10 : Physico-Chemical Characteristics of Water of River Yamuna

	Season	pH	Temp. (°C)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Turbidity (NTU)	TDS (mg/l)	Conductivity —	Water current (m/sec)
R _I	Summer	7.1	14	9.5	1.1	2.9	19.8	121.5	354.6	1.4
	Rainy	7.1	12	8.7	0.9	3.1	22.3	124.2	264.3	NM
	Winter	7.0	8	10.2	0.8	2.7	9.7	114.5	219.3	1.5
R _{II}	Summer	7.3	25	7.9	3.7	4.3	29.5	252.4	352.9	1.0
	Rainy	7.2	21	7.8	3.7	4.0	36.3	266.5	363.3	NM
	Winter	7.3	18	8.2	3.8	3.8	12.9	146.1	367.4	1.1
R _{III}	Summer	7.4	35	6.2	5.9	10.4	44.0	278.8	498.2	0.42
	Rainy	6.9	28	6.0	6.7	10.1	48.2	322.4	511.3	NM
	Winter	7.2	22	6.7	8.2	9.9	18.6	227.3	459.5	0.51

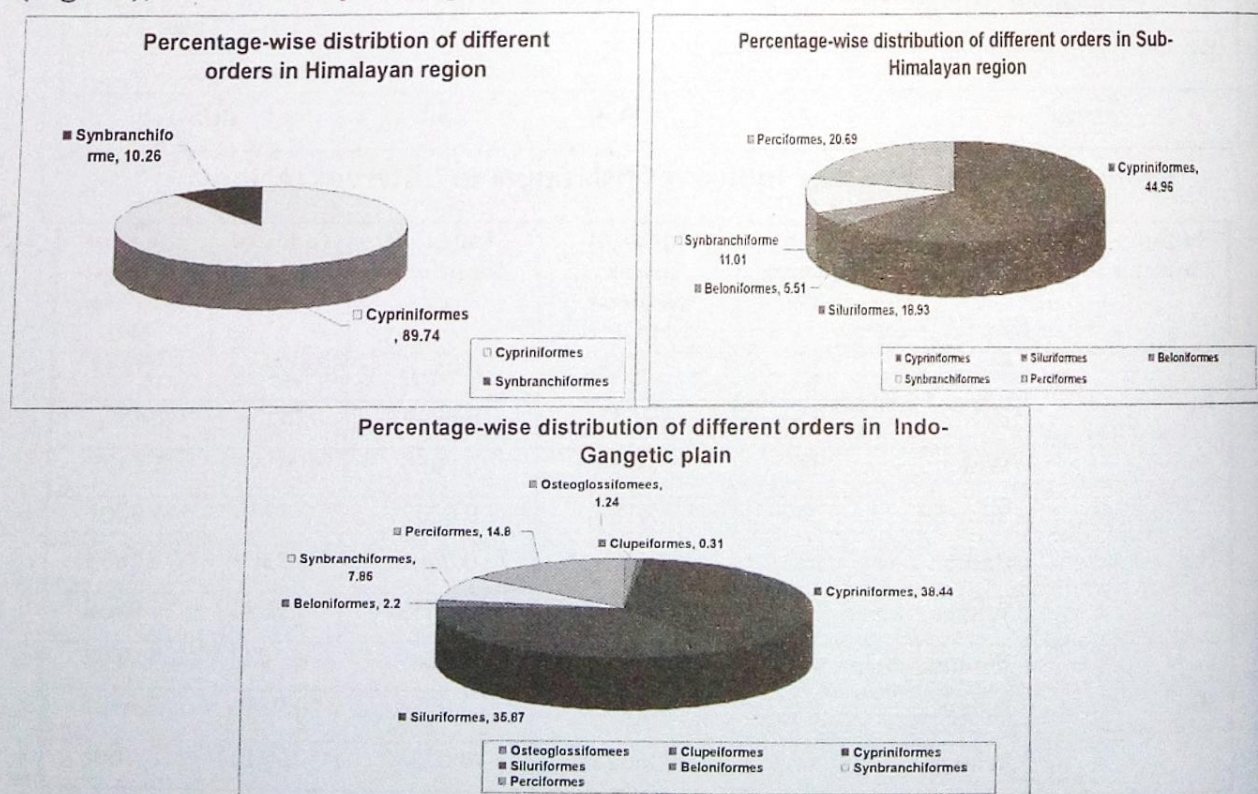
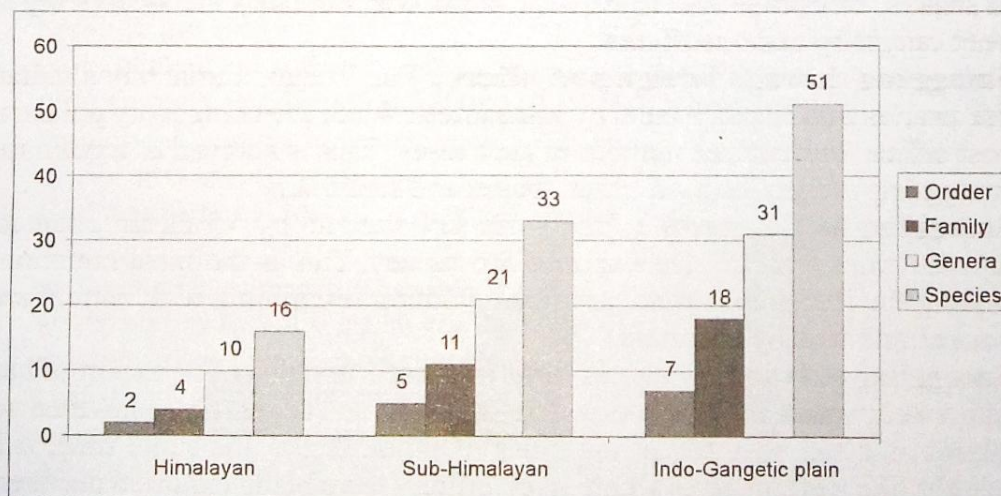
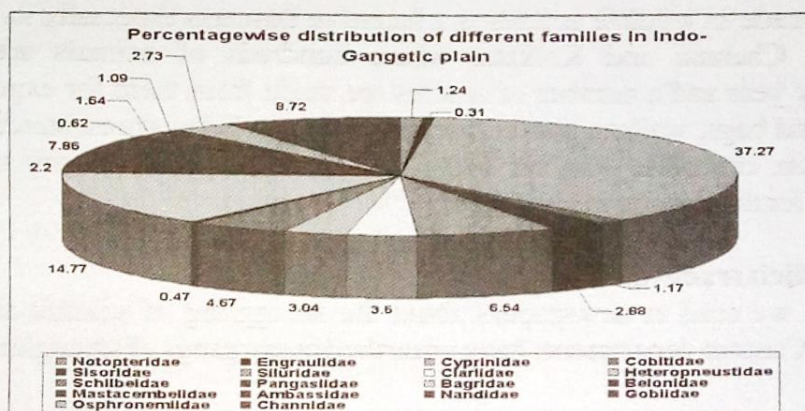
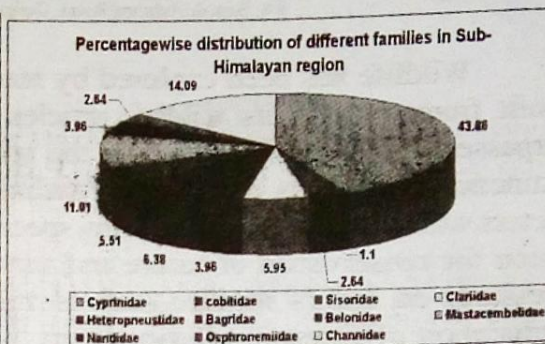
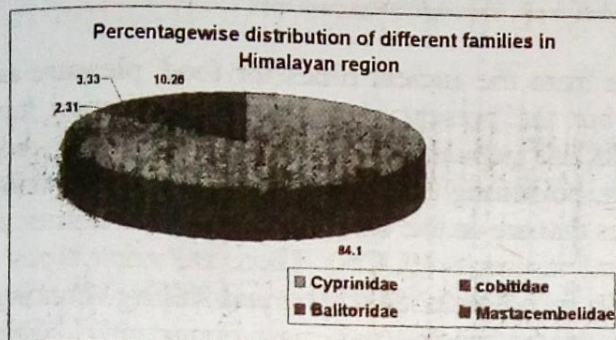
Fig. 2 Showing percentage-wise fish distribution of different Orders from Himalayan (Fig.-2a), Sub-Himalayan (Fig.-2b) and Indo- Gangetic plain (Fig-2c)

Fig. 3 Showing percentage-wise fish distribution of different Families from Himalayan (Fig.-3a), Sub-Himalayan (Fig.-3b) and Indo- Gangetic plain (Fig-3c)



PRESSURES ON WILDLIFE

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Wildlife has been explored by man from the ancient times for food, pleasure and profit from trade in its wildlife articles but the present commercial exploitation have surpassed all the limits, reducing the wild life population to a great extent often with extinction as the only possibility. Poaching, poisoning and then illegal export are various factors which have endangered many species that are on the 'Red Data Book' of International union for conservation of nature and natural resources (IUCN). There are many types of pressures on India's wildlife such as trade in wildlife, poaching and killing (hunting), denudation of forests, pollution, entry of exotic species and most importantly, habitat destruction.

Trade in Wildlife

In India, trade in wildlife articles is a lucrative business especially in big cities like Delhi, Mumbai, Chennai and Kolkata, where hundreds of animals are slaughtered mercilessly every year and a number of articles are made from them for export and sale in open market. Hand bags, wallets, purses, varieties of bags, belts, shoes, suitcases, portfolio bags of snake skin, crocodile skin, fur coats of various animals and ivory articles are the largest attraction for the foreign tourists.

Smuggling (or Illicit trade) in Wildlife

At times, we read in newspapers about the smuggling of wildlife articles. Forest departments and Custom departments have unearthed many gangs of smugglers dealing with wildlife articles.

1. **Smuggling as passenger :** One can come across a number of cases in the custom godown, many wildlife articles found in the passenger baggage as ivory articles, bags of snakes, crocodiles and lizard skin, lizard skin, fur coats and skin of big cats have been caught by custom officers.
2. **Smuggling through foreign post offices :** The foreign tourist buy a valuable wild life articles and dispatch them by post parcels. While checking ivory goods in foreign post office, one can see number of such cases. This is adopted as a main method of smuggling of tiger, leopard, chital, snakes and lizard skin.
3. **Smuggling of Garments :** This is the key method by which fur coats and other articles from wild life are exported for money. This is the most common method among the illegal exporters. Artificial clothing resembling with natural are mixed, packed and send by exporters.
4. **Smuggling of Ivory articles as bone or plastic articles :** The export of handicrafts and jewelry made out of camel and buffalo bone and boxes, tables covered with white plastic is a big business in big cities of India. But at the same time, it has been caught; like certain cases where ivory articles were being exported declared as bone

or plastic articles.

5. **Animal skin as leather article :** So many cases have been caught when purses, bags, suitcase, belts made out of snake skin and crocodile skins are smuggled out as leather goods. It is to be pointed out that custom officers are not technical experts of wild life and so there have been instances when such cases are not caught.
6. **Duty free shop :** In the transit lounge of Santacruse airport (Mumbai), it has been noted that duty exempted from custom check are caught. In past, large quantities of wildlife articles and ivory articles were being sold freely without any implementation of Wildlife Protection Act, 1972.

Hunting (killing)

It is an ancient business endeavor probably as old as our species. There are still races and tribes of man who must hunt to live for their livelihood but vast majority of us including the common people do not depend on a gun. A spear or a bow and arrow were used for hunting. Nevertheless, hunting survives and flourishes as a sport in all technologically advanced countries particularly in the United States. If properly regulated, hunting is primarily a conservation activity. It serves to control the population sizes of animals such as deer, rabbits etc. that would tend to multiply excessively in the absence of their original predators. Many wild animals are hunted for medicinal purposes, ornaments and aesthetic purposes. Gall Bladder of bear and musk gland from musk deer, feather of peacock, head of hornbill, monitor lizard, owl etc. are common examples of poaching and hunting of these animals.

1. **Hunting for food and medicines :** For example Indian frog legs are considered delicacy for eastern countries and thousands of frogs are killed every year for the money. Turtle also tortoise eggs and their flesh are exported to foreign countries for the revenue. Meat and eggs of jungle fowl are eaten by many people. Besides these, large numbers of animals are killed for food such as sambhar, neelgai, deer, hare, wild boar etc.
2. **Hunting for money :** In a poor country like India, there is always a lust for quick and easy money. Illegal hunting is the alternative in this regard. Wild animals' products are sold at higher rate. The skin of big cats like tiger, lion and leopard, ivory of elephant and horn of rhino are very costly. This has led to mass killing of wild animals and almost extinction of some animals like cheetah. The meat of many wild animals like deer, wild boars, sambhar, neelgai and jungle fowl has also been in great demand.
3. **Bad hunting method :** Tribal and nomadic people used poison as a method for hunting. Use of poison bait has resulted in death of many animals. Other bad methods of hunting are use of electrocution and spray of poisonous substances in water bodies to kill the fish etc. Igniting the fire to forest areas to drive away animals in one direction for shooting easily.
4. **Hunting for museum collection :** The hunting or trapping or by shooting of animal/specimen for museum collection sometimes contribute and cause depletion of some species and resulted into endangered species. The American

Museum of Natural History is alone has nearly a million bird species in its permanent collection. Fortunately, most contemporary vertebrates are already well represented in museum collection. It should be harmful to the animal life if a large number of collection of museum specimen are done more than justified.

5. **Hunting due to superstition** : A wide variety of animals are hunted for superstitious reasons in the belief that their fur, feather, bone, claw and other parts will have magical powers. Although such beliefs occur among most of the human population of the world, the demand of Chinese medicines of animal origin have placed the greatest strain to threatened (endangered) species.

Deforestation

During macro-level exploitation the following human activities have resulted in cutting down the forest in the mountains and elsewhere such as wildlife areas. Forest have been destroyed for obtaining fuel (firewood, charcoal), timber (construction of building, furniture, toys, sport good, musical instrument, boxes, boats, truck bodies); fodder for cattle, sheep, goat and camels; industrial raw materials (for plywood, paper, pulp, rubber) and minor forest products (medicinal plants, gum, resins, tannins from bark), maple sugar, insecticides, essential oils, cooking oils and spices etc.

1. **Exploitation** : Numerous forest trees have been felled and vast areas of land left barren for the mining of ores, mica, coal, iron, limestone and so on. This has resulted in loss in production, drought, soil erosion. Due to loss of top soil, desertification, surface water pollution, lowering of ground water, table water and vanishing of wild life are the consequences. The transportation of ores causes air pollution.
2. **Population Explosion** : Due to rapidly increasing population of human beings and their livestock and consequently ever-growing requirements such as land for housing and cultivation has been a spurred in the demand on forests. The fact is that, the forests are essential for survival of wildlife species.
3. **Urbanization and Human Settlements** : Grazing and pastoral activities, shifting cultivation, dams and hydel projects, railway tracks, roads and highways, establishment of new industries and educational institutions and development of recreational centres for increasing tourism, have caused more and more denudation of forest covers. For instances, about 10 thousand hectares of land were required for the establishment of 'Pant Nagar University' from Tarai forest in Uttarakhand.
4. **Forest Fire** : Forest officials say that there are many causes of forest fires. Rising temperature which when crosses 30°C and low humidity could cause fire. But, 90% of the fires are triggered by human being. Sometimes, fire is created deliberately to capture the wildlife by poachers. Generally, they leave half lighted bidi or cigarette that is causative to fire in the forest. Fire hazards adversely affects the vegetation, soil, drainage, agriculture and water qualities. Forest fire destroy the standing trees and consume the seeds and seedling of the future forest, created by human being. They burn the rich humus of the forest floor and pose grave danger to wildlife. Lastly, certain natural forces, land slides, earthquakes and flood have also

contributed to the destruction of forest vegetation. Destabilization and soil erosion, wind (hurricane), ice and snowfall also damage the forest trees and the logs of trees are more prone to attack by fungal diseases and insect pests like termites.

Infact, until 50 years ago, the number of trees cut down from the Himalayan regions of Garhwal (Uttarakhand), H.P., North Bengal or North eastern India was not large. In recent years, felling of trees in these regions have been on a very large scale and hence the vanishing of wildlife.

Pollution and Wildlife

Many wildlife species have already become extinct and so many are on the verge of extinction. Pollution is one of the important factor for the depletion of our wildlife. The ever expanding industrialization, urbanization and increasing demand for growing more food have produced several problems in environmental pollution which has directly affected our fauna and flora. There are indications that if large scale pollution of environment and other conditions, earth's life supporting system will fail with disastrous consequences.

Several insecticides are effectively used in controlling various pests ultimately goes to river, streams and ponds and create problems for life. When insecticides are sprayed in field and forests, they enter the body of animals through polluted water and affect their life. Excess fertilizers are used to enhance the agricultural produce for food, ultimately reached to water bodies and harm the aquatic life.

1. **Effect of pollution caused by industries :** The pollution of river and streams by industrial wastes have been a problem since beginning of the civilization because it produces most unsanitary conditions in our environment. The paper factory wastes causes oxygen depletion which is a most common difficulty because of long term biological oxygen demand. Chemical oxygen demand are created due to the presence of lignin of the wastes is high. Water becomes highly toxic due to the presence of the chlorine, sulphur compound and other dissolved compound. The presence of these colloidal particle of lignin and cellulose, the gills of fishes stop the normal gaseous exchange resulting in high mortality. Industrial effluents consisting sulphur, H_2SO_4 also affect eggs and larvae of fishes and other aquatic life forms.

Toxic effects of metallic compounds, leads firstly due to the coagulation of mucous secretion in gills and protoplasm of living cells which disturbs the metabolism. Secondly, the iron poisoning on the gill cover with dense brown coating makes respiration difficult. It adversely affect the aquatic fishes and other aquatic fauna.

For mammals, toxaphene is one of the most toxic chlorinated hydrocarbon insecticides which is used widely in farm crops and as a poison to control undesirable fish population. From fields it reaches to the aquatic environment and affect wildlife.

2. **Radioactive wastes :** The contamination with radioactive fall out and wastes, especially the latter is becoming increasingly important, but it is still rather difficult to evaluate the danger in a comprehensive way. Although radiation undoubtedly damage the ecosystem, there are many ways to administer radiation and radioactive material and different communities to study. Indeed, most of study of radiation damage concern with particular species usually wildlife and man whose slow rate of maturation and long life span. Many wildlife species are susceptible to genetic and somatic variations that accompany prolonged effect at low level radiation.

The major sources of radioactive wastes are nuclear explosion that produce fall out accidents at atomic power and other nuclear power stations and a variety of research laboratories including medical and biochemical factories which release radioactive wastes into river and other water bodies. It is impossible to check each laboratory more often than weekly or monthly. It is easy for technicians or scientists to be careless about the handling in the use of radioactive materials. But in spite of the potential hazards of radioactivity, there is no evidence that laboratory produce radioactivity – wastes are harmful to natural community (wildlife) and human beings.

3. **Thermal Pollution :** More significant than pollution by radioactive wastes is the problem of disposal of excessive heat produced by nuclear power stations, conventional power plants, gas works and other industrial facilities also produce thermal pollution. The direct effect of heat on aquatic ecosystems is variable. Most aquatic creatures exist near water and if changes in water temperature increase its effect activity and energy requirement. If the temperature rises, oxygen consumption increases but oxygen solubility in water decreases. At some point, a lethal temperature is reached and which causes death of large number of aquatic animals. The rising temperature causes sex determination in marine turtle. If it is too high, the female sex individual exceed the male.

Thermal pollution also damage ecosystem indirectly. It aggravates effects of poisons and accelerate deoxygenation process which is ultimately harmful to even large sized animals.

4. **Oils and detergents :** Detergents are among the few pollutants that advertise their presence as 'mountains of a white foam' floating down in the river can be harmful (oil slick in Gulf waters) to many aquatic wildlife. Oil spill from ship kill the biota of ocean. Marine bird life is badly affected because they cannot fly and die if they are caught by sticky oil etc.
- (v) **Air and Noise Pollution :** For the benefit of mankind, a network of roads and railways are built up. Most of the road and railway routes pass through the dense forest where wildlife resides. These delimit the area of free movement of wild animals. It also affect reproductive capacity. Moreover, many animals run away from the noise of passing vehicles. Likewise, if industries are setup in dense forest, it causes both air and noise pollution. Polluted air and noise in such areas adversely affect the wildlife.

Atmospheric Pollution

Nearly, all of the earth's total energy input comes from the Sun. It is supplied largely in the form of visible light (4000 to 7000 Å°). The ozone in our atmosphere prevents the transmission of most ultraviolet solar radiation below 300 Å° and the atmosphere water vapour absorb much of the incoming, radiation above 8500 Å°. Approximately, 1/3 of the incoming energy is reflected back, so the total energy falling on earth's surface is the total incoming energy – the absorptive and reflective doses. Most of the net energy is absorbed by materials of earth and re-radiated as energy of long wavelength and low energy (heat). A small amount of energy (light) falling on the surface of the earth is absorbed by plants and eventually also re-radiated as heat generated by metabolic processes and decay.

During the past century the extensive use of fossil fuels has caused an increase in the atmospheric carbon dioxide concentration from 5 to 10%. This carbon dioxide acts in turn as one way factor preventing the reradiated heat energy from leaving the earth's atmosphere, but continuing to transmit the incoming higher energy radiation from the Sun. It is known as 'Green House Effect'.

Habitat Destruction

It is a disturbance of the physical environment in which a wildlife population lives either on land (forest) or marine water (ocean) including fresh water bodies like lakes, streams, ponds, rivers, estuaries, etc. The change in the habitat can range from small gradual disturbances such as chemical changes generated by air and water pollution to major events such as total destruction of a forest by bulldozers or fire. Small-scale disturbances tend to affect only population of the most susceptible species. For example, oxygen loss from eutrophication by sewage water (which is rich in minerals and nutrients) in ponds and lakes first kill populations of susceptible game fish such as trout and bass because they need more oxygen than carp or gar fish. Denudation of forests caused man-animal conflict because forest animals has no place for better living, not getting natural food and shelter etc.

Habitat destruction is currently the major cause of extinction of species. This is not only because of destruction generated by human population growth but also because of populations of many species can decline simultaneously when the habitat is disturbed.

Invasion of Exotic Species

Deliberate or accidental introduction of non-native (also called 'exotic' or 'alien') species into new areas has been perhaps the single greatest alteration of natural populations. Few people realize the enormous scale on which human have either accidentally or purposely transferred organisms or species from one area to another. More than 1500 non-native insect species and more than 24 families of non-native fish have been introduced into North-America. Virtually almost any given lake or bay contains non-native plant species, both for agricultural and ornamental purposes ultimately proved harmful to native species. For example the Eucalyptus tree, Parthenium

(congress grass), Eupatorium and Lantana are the exotic species in India. Once introduced species are established their growth can be truly explosive. The Japanese beetle arrived in New Jersey in 1916 on a shipment of plants. By 1941, they had spread over an area of 53000 sq. km.

'Killer bees', a strain of bees resulting from the hybridization of African bees with native South American bees are undergoing a population growth and expansion. Although 'killer bees' have received much alteration, the destruction of native honey bee population by those hybrid bees has occurred. The damage caused by 'Killer bees' is on a much smaller scale than the effects generated by the accidental, introduction of Zebra mussels into lake Erie in the mid-1930s. These fast-growing and fast-breeding mussels from Asia have spread to the other Great Lakes. They attach to water intake pipes, boat hulls and other underwater structures. They compete with native species of animals for oxygen and Plankton and are causing billions of dollars in damage as they spread through the Great Lakes and into the vast Mississippi river drainage system.

Over Hunting (Overkills)

Overkills and secondary extinctions are external causes of extinction caused by altering the biological environment. Overkill is the shooting, poaching, trapping or poisoning of certain wildlife species, usually for sport or economic reasons. It is difficult to cause the extinction of some 'pest' species, such as roaches or mice by overkill because such species have large populations and reproduce rapidly. However, overkill has eliminated some populations of larger animals because of their relatively small populations and slow rate of reproduction.

Economic motives for over-kills include protecting domesticated animals from predators such as lions, tigers, leopards, wolves; but also because the hunted animals have economic value. Elephant's ivory, Rhino horn, leopard skins and tropical bird feathers are but a few such animal products generated by killing for economic purpose. The effect of this is illustrated by the decline in rhinoceros populations. These animals have been hunted to near extinction because their horns are thought to have sexual stimulant (Aphrodisiac) or curative powers to infertility. It seems likely to lose all Rhino species in near future from all over the world.

Secondary extinction

This occurs when death of one animal population causes the extinction of another animal population due to habitat destruction. Often, this involves the loss of food species. For example, the Giant Panda of China subsists largely on a diet of Bamboo tree leaves. Because, bamboo forests are being destroyed by expansion of human populations, the Panda may become extinct from this cause alone. Other examples are more subtle, reflecting the complex and unpredictable interactions among populations that make the effects of environmental disturbances by human activity so difficult to predict. The extinction of Dodo bird in eighteenth century has caused the calvarias tree to become unable to reproduce. Dodo ate the seeds of the tree and the Dodo's digestive system removed the seed covering, which allowed the seed to germinate. Such a symbiotic relationship between two populations must not be disturbed.

Role of Dentistry in dealing with man-eaters (Identification – Shot Placement-Cause)

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When I first attended the Dental Material Sciences class as a teenager 25 yrs ago. I had little idea that the first chapter on Gypsum Products would one day help me identify killer big cats in my home state - Uttarakhand. A state which still has about 60 % forest cover and whose entire population is less than that of Delhi. Unfortunately it also has the highest incidences of man- animal conflict in the country.

17 January 2015,

I had just finished work and sat down for dinner when I got a call from a Forest Officer. A ten years old boy had been killed by a big cat as he stepped out of his house. There was a pool of blood outside and the boy's footwear but nothing else. The pug marks in the garden indicated the work of a man-eating leopard.

Identification

I had a quick dinner and reached the spot within an hour. I poured Plaster of Paris casts of the pug marks. Pugmarks give vital information on the sex and size of the leopard. On careful examination we came to the conclusion that the killer was a female leopard. We combed the area till 3 am, along with the Police and Forest Officials, but there was no trace of the boy or the animal. The boy's half eaten body was recovered the next morning in thick jungle almost 400 meters away from the house.

Shot Placement (Anatomy)

It took us a week to finally locate the animal's movement. The pug marks were a perfect match and we were sure that the maneater was closeby. There were other leopards in the area but as a "Registered Shooter" and a wildlife lover. It was my responsibility to get the maneater and avoid harm to any other leopard.

23 Jan 2015 .

A machaan (hide) was built on a favourable tree. Another shooter, Arjun Balraj Mehta (with his .375 mag rifle, and a life member of the WPSI) and I (with my .3006 rifle) took our position . A goat was tied as bait below the machaan.

We sat still and waited. Finally the maneater came. It had eaten nothing for almost a week. It was now hungry and dangerous. Leopards are the only big cats that can climb trees with ease. Even on a machaan one is not 100% safe. On a dark moonless night. The killer can see and hear 6 times better than humans. We take time to identify the animal. When I am sure that we have the maneater in front of us. We slowly pull up our rifles and at the count of three ,squeeze the trigger. The two bullets tear through the heart and lung bringing the animal down immediately. The shot placement is most important. A poorly placed shot which is unable to hit the vital organs will result in injury and make the

animal suffer immense pain . Thereby rendering it extremely dangerous. As a Shikari our aim is to shoot to kill. A good understanding of the animal's anatomy is hence required.

Cause

It is always sad when an animal as majestic as a leopard turns maneater and has to be terminated. The only consolation is that further human lives will not be lost. When I get down from the machaan, I carefully examine the claws and teeth of the maneater. The approximate age of the animal can be judged by the dentition. This one turn out to be a 6 years old female. There is a distinct horizontal fracture line in the mandibular right canine. The fracture has broken the continuity of the enamel and dentin and infected the pulp . Canine being the largest tooth has the largest pulp chamber.

I am convinced that the acute pain caused by the injury had altered the leopards normal behaviour and forced it to turn to easy prey (humans).

Mr M D Chaturvedi in his book on leopards and panthers has correctly said:

There are two tragedies in the life of a hunter.

One:

Not getting the trophy (animal) he is after.

two

The other (more serious one) : Getting it



Fractured Lower Mandibular Canine Tooth in the killed Leopard

My First Attempt to Study Birds

Dr Manisha Uniyal

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Birds are glorified flying reptiles. They always attract our attention. Since my childhood, I used to observe them closely: How they eat? What they eat? How they fly? How they communicate? During this winter vacation, my daughter, a student of class five got homework to study the birds visiting our house. I was a bit worried that in one month how we will be able to find out the details of birds visiting our locality. We planned to keep some food and water on the boundary wall of our house and to my great surprise I observed that within one hour some birds came and finished it. My daughter became very happy and we started putting some food and water religiously in the morning time. The number of birds increased within a few days. We reside in a place nearby a reserved forest in Dehradun. Therefore, a variety of birds started to visit our house. They included Babblers, Bulbuls, Mynah, Doves, Woodpeckers, Crows, Parrots etc. We collected some information about these birds from the book "Birds of the Indian Subcontinent" by Grimmett et al 1998 which is as follows:

Babbler

Order- Passeriformes, Family-Leiothrichidae, Zoological Name *Turdoides caudatus*

Babblers are commonly called seven sisters due to their habit of staying in groups of 6-10. They are small to medium sized passerines characterized by soft loose plumage, short wings and strong legs. They typically live in flocks. They are noisy and have a wide range of chatters, rattles and whistles. Many are terrestrial or inhabit bushes or grasses close to ground while some are arboreal. They are chiefly insectivorous and their diet also includes fruits, seeds and nectar. Arboreal species collect food from leaves, mosses, lichen and bark. Terrestrial species forage by digging around the dead foliage. It is non migratory having weak flight.

Bulbul

Order- Passeriformes, Family- Pycnotidae, Zoological Name *Picnonotus leucotes*

These are medium sized passerine song birds (the name bulbul is derieved from Persian word which means nightingale) with soft fluffy plumage, short and rounded wings, medium to long tails and short weak legs. The plumage of some species is colourful with yellow, red or orange vent, cheeks, throat but most of them have uniform brown to black plumage. These are common familiar birds in gardens and around human habitation. They feed on berries, fruits, insects etc. Many species are noisy especially while feeding. Bulbuls have a variety of cheerful, loud chattering, babbling and whistling calls. They are genrally monogamous. Red vented bulbuls have been captured for pet trades.

Flycatcher

Order- Passeriformes, Family- Muscicapidae, Zoological Name *Turpsiphone*

paradisiaca

These are small insectivorous birds with a small flattened bill and bristles at the gape (interior of the mouth) which helps to capture flying insects. Legs are short and weak. Many species frequently flick the tail and hold the wings slightly drooped. Flycatchers are usually found singly or in pairs a few join mixed hunting parties of other insectivorous birds. Most of them are territorial in breeding season.

Dove

Order- Columbiformes, Family- Columbidae, Zoological Name *Streptopelia orientalis*

Commonly term name Doves and pigeons are often used interchangeably but dove is generally used for smaller species and pigeon for larger ones. They have stout compact body, short neck, small head and bill. Their flight is swift and direct with fast wing beats. During takeoff and alighting the tail is widely fanned. Their main diet involve small invertebrates, grains around cultivated lands etc. When disturbed it flies upwards with a noisy clatter of wings and then glides down to settle nearby. The peculiar characteristic of this bird is that both male and female produce a type of milk in their crop (crop milk). This is highly nutritive and used to feed their young ones.

Woodpecker

Order- Piciformes, Family- Picidae, Zoological Name *Picoides pubescens*

They are mainly arboreal usually seen climbing upwards on vertical trunks and branches of trees. Their bill is powerful for boring into wood to extract insects and to make nest holes. Their flight is strong and direct. They make characteristic loud calls. They may occur singly or in pairs. They possess zygodactyls feet. This arrangement is good for grasping the trunks of trees. Woodpeckers are diurnal roosting at night inside holes.

Parrot

Order- Psittaciformes, Family- Psittacidae, Zoological Name *Psittacula krameri*

They have a short neck and short, stout hooked bill with the upper mandible strongly curved and overlapping the lower mandible. Their diet is almost vegetarian including fruits, seed, buds, nectar and pollen. Typically parrots use foot to hold their food and bill to crack and dehusk seed or nuts before swallowing. Their flight is swift, powerful and direct. Most species nest in the natural tree holes which they enlarge according to their needs. Some species use barbet or woodpecker holes. Parrots are intelligent, they are able to mimic human speech.

Though this was a short study of 2-3 months (December-February 2014) only, I made some observations about the habits of these birds which are as follows:

- These birds like to eat crushed chapatias, boiled rice but they don't feed on grains like pulses, rice etc.
- They used to take bath and drink water in afternoon time usually between 3-4 pm.
- They used to make different type of sounds when the food was there and in absence of food they used to make different type of calls.

- Himalayan Bulbuls came during the month of December to January only while the red vented Bulbuls stayed all the time. Bulbuls stayed in a large group of 5-10.
- Two spotted doves used to stay together and feed when other birds left the place.
- Two woodpeckers stayed together .
- A number of babblers were present all the time.
 - Parrots do come to nearby trees but never came down from high trees to eat food.
 - A pair of Hornbill was also spotted on high trees.

Himalayan Bulbuls



Woodpecker



Doves



Little pied Flycatcher



Babblers



Parrot



From the Archives of "Cheetal"

Save India's Last Environment

Bulu Imam*

Regional Convener, INTACH, Hazaribagh Chapter

To day, the threat to our forest is from the State and not the people who live in villages adjacent to, and sometimes in, the forest areas. The development projects which the state has repeatedly targeted in mineral or hydel rich areas have completely destroyed the Indian countryside, specially in the past half century of our indepedence as a nation. This is indeed most unfortunate. Not a strong enough statement has been made against this destruction of wildlife habitat which, although destroying the habitat for the survival of the large fauna such as the tigers and elephants, has ruined the natural existing ecosystems of the most complex order of natural wildlife.

The forest people have been every where targeted as the enemies of the forests which is farthest from the truth, since it is infact these simple societies that have been the custodians of our forests for millennia long before the Mughals established tribute or the British established land title. Some uniformed persons have opinioned that the tribal have never *possessed* the wildlife of India. This is most untrue, since we find wild animals as the most important subject illustrated by the pre-historic rockart throughout India, and we must not in our drunken state of the power and economy-hunger forget that the wildlife of India belongs first and foremost to the people of India.

In my state of Jarkhand during my lifetime in the past sixty years I have seen once beautiful old-growth forests stripped and vandalized by so called Development projects, in particular (i) Damodar Valley Co-opration (ii) Coal India coal mines project. This is most unfortunate indeed that the architects of modern Indian could plan the systematic whole sale destruction of our forests and rivers in the name of Development. It is, indeed, most unfortunate. Today, the entire lowre Damodar vally has been destroyed by large coal mines and large dams, not only in the rivers but in the valleys of its tributaries as well (i.e. Baraker, Bokaro, Konar etc.) We have been a patient and believing, not to say long suffering population. We have seen this immense destruction being passed off in the name of Development like some kind of holy writ, to be believed in and accepted without any sort of protest. How many Sunderlal Bahugunas and Baba Amtes and Madha Patkars, Billy Arjun Singhs, Bittu Sahgals, Valmik Thapars have we as a nation of a billion people produced ? Not many. This is both frightening and sad. It is frightening because it shows not enough care. We have become a nation of lip servers. It is the effect of our national brow beating by our erstwhile colonial masters no doubt. Are we going to let it continue.

Today the last remaining forested wildlife corridors of elephants and tigers between Hazaribagh, Ranchi, Chatra and Palamu, in the upper valley of the Damodar river, are being threatened by open cast coal mines in the terribly destructive North Karanpura Coal field Priject which I have been steadily campaigning against ever since 1987.

Our Thousand Tigers Ecosystem campaign may be found on the internet at

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www.web.net/~pcarter/hazaribagh . Over seventy opencast coal mines are being launched to destroy a vital natural ecosystem which is one of the greatest natural heritages of this once great nation. I am deeply ashamed and I wish to share this deep shame with all 'Cheetal' readers as contributor to this prestigious journal ever since 1958.

The once clear-flowing Damodar river ran swiftly through green mountains and original old-growth sal forests filled with Sambar, tiger, leopard and herds of migratory bison and elephants not so long ago. Today huge mines over three hundred feet deep have gouged open these green wildlife corridors (Ashoka, Piperwar OCP's) and threaten still more (Magadh, Amrapalli proposed OCP's). Two hundred and more tribal villages and their forest environs stand threatened. Due to the presence of Permian deposits of coal the NKCP area has the highest concentration of lead (300 parts per million), and the high presence of arsenic, iron, chromium, manganese, etc. in the sediments and surface rivulets flowing through Dakra and Karkata are a life threat to residents along the river's banks. All these poisonous chemicals are present well above tolerance levels (Dr. Nitish Priyadarshi, Principle investigator, dept. of Geology, Ranchi. This is a blot on the State.

I appeal to all 'Cheetal' members to voice out their opinions much more vociferously and audibly, using the principle that we will not countenance any further destruction to India's forests and biodiversity even in the name of Development, because we can never put back the loss of biodiversity. This has to be taken as a campaign of information to every Indian child in classrooms throughout the country. It is no use speaking on behalf of conservation or planting trees such as urban-based environmentalists have so far been indulging in. We who live in the jungle areas where the real damage is being done are not of the view that such goody campaigns are either adequate or justifiable where the State is allowed to go on destroying one pristine eco-habitat after another in the name of Development. We must not any longer countenance State sponsored destruction of the environment and this information must be taken to every classroom in India and every Indian child must be made aware that we elders are destroying their environment for our present use and purposes in the name of Development. Will they agree to it?

अफ्रीकी भैंसों एवं भारतीय भैंसों का तुलनात्मक अध्ययन

डॉ० जे०वी०एस० रौथान

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अफ्रीकी भैंसों और भारतीय भैंसे रूप आकार खान-पान एवं बनावट में एक दूसरे से बहुत मिलती-जुलती हैं, किन्तु वास्तव में ये बिल्कुल अलग-अलग जाति के जीव हैं। जिनका जीव विज्ञान के अनुसार सम्भवतः निकट का सम्बन्ध नहीं है। भारत में भैंसों को लोग पालते हैं उनका दूध पीते हैं, सवारी भी करते हैं। भारत की भैंसे तो पालतू 'जल भैंसे' अर्थात् वॉटर 'बफैलो' हैं किन्तु अफ्रीका की 'किंग बफैलो' जिन्हें कभी पालतू नहीं बनाया जा सकता है। ये बहुत खतरनाक होती हैं जो मौका पड़ने पर बाघ को भी मार देती हैं।

अफ्रीका के पाँच बड़े पशुओं में शेर, तेंदूआ, हाथी, गैण्डा तथा भैंसों का नाम आता है, जिन्हें देखने के लिए सम्पूर्ण विश्व के पर्यटक उतावले रहते हैं। सारे वन्य जीव मात्र आकार के कारण बड़े नहीं कहलाते हैं। बल्कि इसलिए बड़े कहलाते हैं कि ये अत्यंत खतरनाक होते हैं और यदि किसी के पीछे पड़ जायें तो उसका बच पाना बहुत ही मुश्किल होता है। अफ्रीका के इन पाँच वन्य पशुओं में भैंसा ही सबसे खतरनाक माना जाता है।

अफ्रीका के मध्य भाग में अधिकांश भैंसे पाई जाती हैं। अधिकतर घास चरने के लिए इनको जंगल के निकट खुला मैदान पसंद है। इस प्रकार सोमालिया, इथोपिया, नामीबिया, जिम्बाब्वे, बोत्सवाना, दक्षिण अफ्रीका, केन्या तथा तंजानिया आदि में पायी जाती हैं। अधिकांश जंगली भैंसे समूह में रहती हैं ये 25 से लेकर 300 या अधिक के विशाल समूहों में रहती हैं, एवं घास पर अपना गुजारा करती हैं, सबसे हैरानी की बात यह है कि अफ्रीकी भैंसों और भारतीय भैंसों रंग-रूप, आकार, खानपान तथा बनावट में एक दूसरे से बहुत अधिक मिलती-जुलती हैं, परन्तु ये अलग-अलग जाति के प्राणी हैं, जीव विज्ञान के अनुसार सम्भवतः निकट का भी सम्बन्ध नहीं है। इनकी आदतें भी बिल्कुल भिन्न होती हैं। जहाँ भारतीय भैंसे सीधी-साधी, शांत स्वभाव व पालतू होती हैं वहीं अफ्रीकी भैंसे अत्यंत खूँखार, ताकतवर, हिंसक, प्रकृति तथा बदले की भावना से ग्रस्त होती हैं।

पूरे विश्व के इतिहास में शिकार के दौरान अब तक जितने भी शिकारी हिंसक पशुओं द्वारा मरे उनमें सबसे अधिक अफ्रीकी भैंसों द्वारा मारे गये। इनसे टक्कर लेने की हिम्मत बाघ भी नहीं कर पाता है। जब भी बाघ इनका शिकार करता है तो वह केवल बीमार, छोटे बच्चों या बूढ़े भैंसों को निशाना बनाता है। अन्यथा ये अपने नुकीले सींगों एवं शक्तिशाली प्रहार से बाघ को गम्भीर रूप से घायल कर सकती हैं या उसे मार तक देती हैं। यदि इन्हें छेड़ा न जाये तो सामान्यतः ये स्वयं नुकसान नहीं पहुँचाती हैं। इस प्रकार अफ्रीकी भैंसों को संसार का सबसे खतरनाक प्राणी माना जाता है। इसका जीव वैज्ञानिक नाम 'सिन्सेरस काफर' है। नर का वजन 800 से 900 किलोग्राम तथा मादा का वजन 500 से 700 किलोग्राम होता है। इनके सींग एक मीटर या अधिक चौड़ाई वाले होते हैं। इनकी ऊँचाई लगभग 1.5 से 2 मीटर होती है। नर 7 से 8 वर्ष में तथा मादा 4 से 5 वर्ष में युवा हो जाती है। 11 महीने गर्भधारण के बाद मादा एक बच्चे को जन्म देती है इनका जीवन काल 15 से 22 वर्षों का होता है। अफ्रीकी भैंसों का किसी जमाने में बहुत अधिक शिकार किया जाता था, जिसका प्रमुख प्रयोजन शिकारी की बहादुरी का प्रदर्शन हुआ करता था। ये शिकारी भैंसों के विशाल सींगों को अपने ड्राइंगरूम की शोभा बढ़ाने के लिए उपयोग में लाते थे। परन्तु वर्तमान समय में इस प्रकार के शिकार पर

पूर्ण रूप से प्रतिबन्ध है, किन्तु इसके बावजूद अफ्रीका में चोरी-छुपे इनका शिकार अभी भी माँस आदि के उद्देश्य से होता है। इसके अलावा इनके जंगलों के नष्ट होने या कम होने के कारण इनके निवास स्थानों में कमी होने के कारण भी अफ्रीकी भैंसों की संख्या काफी कम होती जा रही हैं। अभी अफ्रीकी भैंसों को 'लो रिस्क' (कम जोखिम श्रेणी) जातियों के जीवों के साथ रखा गया है। जिस प्रकार से इनकी संख्या घट रही है। शीघ्र ही इसे संकटग्रस्त जाति के जीवों में रखा जाने वाला है। इनको पालतू बनाने के सारे प्रयास बेकार हो गये हैं। भारतीय भैंस, अफ्रीकी भैंस की तुलना में सीधी-साधी, पालतू जिनकी पीठ पर बैठे बच्चे उन्हें हाँकते हुये ले जाते हैं। लगभग वही शक्ति, वही आकार, रंग रूप, किन्तु फिर भी भिन्न प्रजाति। वास्तव में भारत में रहने वाले किसी ग्रामीण बच्चे को यदि अफ्रीकी भैंसा दिखाया जाये तो सम्भवतः वह उसकी पीठ थपथपाने को आगे बढ़ जायेगा और दूसरी तरफ यदि किसी अफ्रीकी वनवासी को भारतीय भैंस दिखायी जाये तो सम्भवतः वह उससे दूर भागने का प्रयास करेगा। अफ्रीकी एवं भारतीय भैंसों में प्रमुख अन्तर यह है कि अफ्रीकी भैंसों के दोनों सींगों की जड़ें सिर पर मिली रहती है, जबकि भारतीय भैंसों में सींगों की जड़ें काफी दूर-दूर होती है। भैंसों का मानव के साथ सदियों पुराना नाता रहा है। सम्भवतः मानव ने ईसा से तीन सदी पूर्व इनको पालना प्रारम्भ किया था।

भारत की भैंस, जल से अधिक लगाव के कारण 'जल भैंस' नाम से जानी जाती है। इसका जीव वैज्ञानिक नाम 'बुवालस बुवालिस' है ये एशिया, यूरोप, आस्ट्रेलिया सभी स्थानों पर पायी जाती हैं। भारतीय भैंस का औसतन भार 300-400 किलोग्राम से लेकर 700-1200 किलोग्राम तक होता है। इनकी ऊँचाई 1.5 से 2 मीटर तक होती है। इनका रंग अधिकतर काला या भूरा होता है। इनके सींग प्रायः वक्राकार तथा लम्बाई 1 मीटर तक हो सकती है। पूँछ लम्बी एवं अन्त में बालों के घने गुच्छे होते हैं। मादा भैंसे तीन वर्ष में युवावस्था को प्राप्त कर लेती है तथा मादा 10 महीने की गर्भावस्था के पश्चात एक बच्चे को जन्म देती हैं। इन भैंसों को पानी या कीचड़ बहुत पसंद है इसीलिए मुहावरा बहुत प्रचलित है कि "अब गई भैंस पानी में" इसका अर्थ यह है कि यदि भैंस एक बार पानी में घुसकर तथा कीचड़ में लोट कर यह मच्छरों, पिस्सुओं तथा बाह्य परजीवियों से अपनी रक्षा करती है। भैंस भारत तथा दक्षिण पूर्ण एशिया देशों का एक लोकप्रिय पशु हैं, क्योंकि यह कठोर परिस्थितियों को सह सकने में सक्षम होती हैं। इन देशों से भैंस का उपयोग दूध मक्खन, घी आदि बनाने के काम आता है। इसके अलावा नर भैंसों का उपयोग खेती, बोझ ढोने, हल जोतने तथा सवारी, दौड़ आदि के लिए किया जाता है। इसकी खाल उत्तम प्रकार के जूते बनाने के काम आती है। भारत में जंगली भैंसों की एक और जाति पाई जाती है, जो भारतीय वाइसन कहलाती है। यह अधिकतर असम, पड़ोसी देश भूटान, नेपाल में भी पायी जाती है।

भैंस के माँस को 'काराबीफ' कहते हैं तथा इसमें कम कैलोरी होती है। इसका उपयोग बहुत अधिक होता है। सम्पूर्ण विश्व में भैंसों की कुल संख्या 15 करोड़ आंकी गई है जिसकी अधिकांश संख्या एशिया में (90 प्रतिशत) है। भारत में सबसे अधिक संख्या 8 करोड़, चीन में 3 करोड़ तथा तीसरे स्थान पर पाकिस्तान है। भारत की प्रसिद्ध भैंसों में 'नीलीराव', 'नागपुरी', 'कुण्डी', 'मुरा', 'जाफराबादी', 'सूरती', 'मेहसाना', आदि हैं। इनमें सबसे अधिक दूध देने वाली 'मुरा' भैंस होती है।

दक्षिण पूर्व एशिया, इन्डोनेशिया, चीन, वियतनाम, ताइवान, फिलीपिन्स आदि में थोड़ी अलग जाति की भैंस पायी जाती है, जिसे 'दलदल की भैंस' या 'स्वैम्प बफैलो' कहते हैं जिसका जीव वैज्ञानिक नाम 'बुवालस कारबानिस' है। इसका रंग भूरा, पीठ चौड़ी तथा सींग सीधे होते हैं तथा यह बोझा ढोने के लिए उपयुक्त होती है दूध

कम देती हैं। फिलीपीन्स में भैंस को 'राष्ट्रीय पशु' घोषित किया गया है।

आस्ट्रेलिया में भी भैंसे पाई जाती है, जो वहाँ पर बोझा ढोने तथा माँस के लिए आयातित की गई थी, परन्तु वर्तमान समय में कई पालतू भैंसे आस्ट्रेलिया में जंगली भैंसों के रूप में परिवर्तित हो गई हैं, जो लावारिस अवस्था में तथा देखभाल की कमी के कारण जंगलों में चली गई। इस प्रकार उन्हें अब जंगली पशु माना जाता है। उत्तरी अफ्रीका तथा पश्चिमी एशिया के देशों- ईरान, इथोपिया, मिस्र आदि में कुछ भिन्न प्रकार की 'जल भैंसे' पाई जाती है। भैंसों का आयात अफ्रीका तथा यूरोप में भी किया गया, अमेरिका में भी भैंसों के फार्म स्थापित किये गये। उत्तरी अमेरिका में पाये जाने वाले भैंस को 'बाइसन' कहते हैं, आकार में यह विशाल प्राणी है। अगले कन्धों पर एक कुबड़ होता है। सींग छोटे तथा सिर बड़ा होता है। ऊँचाई 2 मीटर तथा शरीर का भार 800 से 1200 किलोग्राम होता है। शरीर पर घने बाल होते हैं। 9 महीने की गर्भावस्था के पश्चात् मादा एक बच्चे को जन्म देती है। किसी समय जंगली भैंसे उत्तरी अमेरिका, कनाडा तथा मैक्सिको में विशाल समूहों में पाई जाती थीं किन्तु इनके माँस, खाल तथा अन्य कारणों के अन्धा-धुन्ध शिकार किया गया। वर्तमान में इनकी संख्या एक हजार तक सिमित हो गई है, आजकल इनको संरक्षित क्षेत्रों तथा निजी पार्कों में रखा गया है।

आभार

मैं प्राणी विज्ञान सर्वेक्षण विभाग, देहरादून तथा जन्तु विज्ञान, डी०ए०वी० (पी०जी०) देहरादून का आभारी हूँ जिन्होंने इस लेख को लिखने में अपने महत्वपूर्ण सुझाव दिये।

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टिहरी जनपद में मानव-वन्य जीव संघर्ष

हेम शंकर मैन्दोला

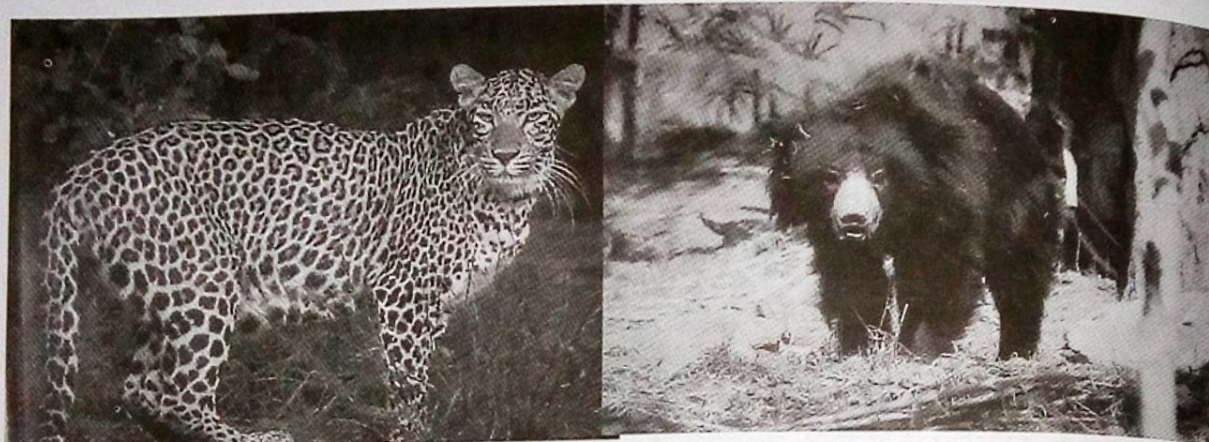
उप प्रभागीय वनाधिकारी, टिहरी वन प्रभाग, नई टिहरी, उत्तराखण्ड

मध्य एवं उच्च हिमालयी क्षेत्र में स्थित टिहरी वन प्रभाग का सकल क्षेत्रफल 1432.68 वर्ग कि०मी० है। टिहरी वन प्रभाग का सम्पूर्ण क्षेत्र पर्वतीय एवं क्षणभंगुर (Fragile) है। प्रभाग भागीरथी एवं उसकी दो सहायक नदियों भिलगंगा एवं बालगंगा के मध्य स्थित है। टिहरी वन प्रभाग का क्षेत्र उत्तरीय अक्षांश 30°-3'-10" से 32°-52'-45" तथा पूर्वी देशान्तर 78°-8'-15" से 79°-2'-45" के बीच स्थित है। वन प्रभाग का क्षेत्र समुद्र तल से 1200 मी० ऊंचाई से लेकर 6904 मी० तक स्थित है। प्रभाग के विभिन्न वन क्षेत्रों का समुद्र तल से ऊंचाई में पर्याप्त भिन्नता के कारण प्राकृतवास (Habitat) में पर्याप्त विविधता होने के फलस्वरूप विविध प्रकार के वन्य प्राणी पाए जाते हैं। प्रभाग के अन्तर्गत वन्य जीवों में मुख्यतः थार, भरल, गुलदार, भालू, घुरल, काकड़, सुअर, बन्दर, लंगूर आदि स्तनधारी प्राणी पाये जाते हैं। वर्तमान में जनसंख्या में वृद्धि, वन्य जीवों के प्राकृतकवास में सतत विखण्डन, क्षेत्र में विकासजनित गतिविधियों में वृद्धि, मांसहारी वन्य प्राणियों के लिए भोजन की कमी तथा हानिकारक झाड़ियों के बढ़ने के कारण वन्य जीवों खास कर गुलदार एवं भालू की मानव बस्तियों में प्रवेश करने की घटनाओं में वृद्धि हो रही है। मानव-वन्य प्राणी संघर्ष का यह एक मूल कारण है।

प्रभाग के सम्पूर्ण क्षेत्रफल के लगभग 17 प्रतिशत भू-भाग लैण्टाना, काला बांसा, व अन्य हानिकारक झाड़ियों उग आई हैं। लैण्टाना एवं अन्य हानिकारक झाड़ियों के व्यापक फैलाव से न केवल पुनरोत्पादन पर प्रतिकूल प्रभाव पड़ रहा है अपितु शाकाहारी वन्य प्राणियों के लिए चारा की कमी भी महसूस की जा रही है। चारे की कमी के कारण शाकाहारी वन्य प्राणी की संख्या में कमी होने से गुलदार भोजन के रूप में मनुष्यों को मार रहा है। पूर्व में ऐसी घटनायें यदा-कदा ही होती थी, लेकिन वर्ष 2001 से वर्ष 2014-15 तक प्रतिवर्ष गुलदार द्वारा लगातार स्थानीय ग्रामीणों को घायल किया जा रहा है या जान से मार दिया जा रहा है। प्रभाग के अन्तर्गत उपलब्ध आंकड़ों के अनुसार वर्ष 2001-02 से वर्ष 2014-15 गुलदार द्वारा प्रभाग में 82 व्यक्तियों को घायल किया गया तथा 19 व्यक्तियों को जान से मार दिया गया। इसी प्रकार भालू द्वारा वर्ष 2001-02 से 2014-15 तक 53 व्यक्तियों को घायल तथा 2 व्यक्तियों को जान से मारा गया है। इस तरह की घटनाओं से स्थानीय समुदायों का वन विभाग के प्रति रोश बढ़ रहा है तथा स्थानीय ग्रामीण विभागीय अधिकारियों एवं कर्मचारियों का प्रायः घेराव कर अपने जनाक्रोश को व्यक्त करते हैं। इसके अतिरिक्त कई बार राज्य विधानसभा में भी मानव वन्य प्राणी संघर्ष की घटनाओं के सम्बन्ध में चर्चा की जाती है। कई बार हिंसक वन्य प्राणियों द्वारा स्थानीय निवासियों को घायल किये जाने अथवा मारे जाने पर जनता द्वारा उग्र आन्दोलन का सहारा भी लिया जाता है जिससे कानून एवं व्यवस्था (Law and Order) की समस्या भी खड़ी हो जाती है। प्रभाग की सीमायें कई ग्रामों से मिलती हैं जिनमें काफी संख्या में ग्रामीण आबादी निवास करती हैं। चारा, ईंधन एवं अन्य जीवन निर्वाह की दैनिक उपयोग की आवश्यकताओं हेतु स्थानीय ग्रामीण समीपस्थ जंगलों में प्रवेश करते हैं और हिंसक वन्य प्राणी के शिकार हो जाते हैं। कई बार गुलदार घर के आंगन से भी वृद्ध एवं छोटे-छोटे बच्चों को उठाने की घटनायें प्रकाश में आई हैं।

प्रभाग में वर्तमान में हिंसक वन्य प्राणियों की प्रत्यक्ष उपस्थिति की घटनाओं की बारम्बारता में बढ़ोत्तरी तथा मानव-वन्य प्राणी संघर्ष की घटनाओं में अचानक वृद्धि होने से यह प्रश्न विचारणीय बन जाता है कि किन परिस्थितियों में संघर्ष की इन घटनाओं में वृद्धि हो रही है। यह एक शोध का विषय है। अतः क्षेत्र की पारिस्थितिकी, हिंसक वन्य प्राणियों के व्यवहार, क्षेत्र के प्राकृतिकवास

की स्थिति तथा मांसाहारी एवं शाकाहारी वन्य प्राणियों के घनत्व का तुलनात्मक अध्ययन एवं शोध वन्य जीव विशेषज्ञों द्वारा किया जाना अत्यन्त आवश्यक हो गया है।



टिहरी वन प्रभाग के अन्तर्गत गुलदार द्वारा घायल/मारे गये व्यक्तियों की सूचना।

वर्ष	टिहरी		लम्बगांव		पौखाल		बालगंगा		भिलंगना		योग	
	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत
2001-02	1	2	0	0	0	0	2	0	1	0	4	2
2002-03	1	0	2	0	1	0	2	0	8	1	14	1
2003-04	1	1	0	0	0	0	0	0	1	0	2	1
2004-05	0	0	0	0	0	0	0	0	0	0	0	0
2005-06	0	0	0	0	0	0	0	0	3	0	3	0
2006-07	0	0	1	1	1	0	2	0	2	0	6	1
2007-08	1	0	0	0	0	0	1	0	2	0	4	0
2008-09	3	1	1	1	0	1	0	0	2	0	6	3
2009-10	1	0	0	0	1	0	7	0	4	0	13	0
2010-11	0	0	5	1	0	0	5	1	5	2	15	4
2011-12	1	0	0	0	0	0	1	2	1	0	3	2
2012-13	0	0	1	1	0	0	0	0	3	0	4	1
2013-14	3	0	0	0	1	0	2	0	0	0	6	0
2014-15	0	0	0	0	1	0	0	0	1	4	2	4
योग-	12	4	10	4	5	1	22	3	33	7	82	19

भालू द्वारा घायल/मारे गये व्यक्तियों की अध्यावधिक सूचना।

वर्ष	टिहरी		लम्बगांव		पौखाल		बालगंगा		भिलगंगा		योग	
	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत	घायल	मृत
2001-02	1	0	0	0	0	0	4	0	0	0	5	0
2002-03	0	0	0	0	0	0	2	0	1	0	3	0
2003-04	3	0	0	0	0	0	3	1	2	0	8	1
2004-05	3	0	0	0	1	0	0	0	0	0	4	0
2005-06	0	0	0	0	0	0	0	0	0	0	0	0
2006-07	0	0	0	0	1	0	3	0	0	0	4	0
2007-08	2	0	2	0	0	0	1	0	2	0	7	0
2008-09	0	0	0	0	0	0	3	0	0	0	3	0
2009-10	1	0	1	0	1	0	1	0	0	0	4	0
2010-11	1	0	0	0	1	0	3	0	0	1	5	1
2011-12	0	0	1	0	0	0	0	0	0	0	1	0
2012-13	0	0	3	0	0	0	0	0	0	0	3	0
2013-14	0	0	0	0	0	0	3	0	5	1	8	1
2014-15	0	0	0	0	0	0	1	0	0	0	1	0
योग-	11	0	7	0	4	0	24	1	10	2	56	3



1 व 2 प्रभाग की भिलगंगा रेंज में गुलदार द्वारा मारी गई बालिका एवं वृद्ध

*"Cheetal", Quarterly News***Rescuing Biodiversity**

Homo sapiens may not have been responsible for the five distinct spasms of distinct spasms of extinctions in geological time that began an estimated 440 million year ago, but humans are centrally implicated in the ongoing sixth wave of severe biodiversity loss. The Convention on Biological Diversity (CBD) was drafted in 1992 to stem the decline. It entered into force a year later with the avowed aim of significantly reducing loss of species and even using them where compatible to alleviate poverty. But nearly two decades later, the treaty has largely failed to meet its targets. There is now another opportunity available to make it work. The parties to the CBD are holding their 10th conference in the Japanese city of Nagoya and with sufficient political will they can reverse the tide of species losses. The member-countries have done well to acknowledge the all-round disappointment that their renewed commitment made in 2002 to reduce biodiversity loss remains a dead letter. They are now challenged to deliver on their assurances and act more intelligently on climate change, habitat loss and degradation, excessive exploitation, spread of invasive alien species, and pollution, all of which affect plant and animal survival. What provides some hope is the persistence of a large amount of biological diversity.

The key to conservation is to recognise the role of nature of providing ecosystem goods such as fodder, fibre, genetic resources, fresh water, and services such as cleansing of air, nutrient flow, erosion prevention, flood control, pollination, and disease regulation. That this economic dimension of nature is being increasingly accepted the world over is heartening. At the Nagoya conference, the group of 77 and China have made the forward-looking suggestion that countries of the South should forge closer cooperation to protect biodiversity, and use financial resources available from developed-country partners. In particular, fast-developing China's focus on protecting 35 priority conservation areas making up 23 per cent of the country is extremely promising. India is also focussed on growth, but it needs to do more for ecosystems facing the onslaught of poorly planned development. It must begin by showing genuine recognition of nature's value. National development policy cannot afford to ignore the central role played by biodiversity. At the global level, the CBD has the opportunity once again to arrive at a consensus on sustainable use of plant diversity. Such an agreement will help local communities access and benefit from use of invaluable genetic resources. The ethical imperative to save the world's species is to restrict consumption of all natural resources to a sustainable level and allow for natural renewal.

Hindu-Editorial, October 21, 2010

Loss of polar bear habitat is imminent, warns study

About one third of the world's polar bear could be in imminent danger from greenhouse gas emissions in as soon as a decade, an U.S. government report shows. U.S. Geological Survey said scientific models don't bode well for polar bear populations across the world. Greenhouse gases are blamed for the climate warming that's reducing polar

bear's summer sea ice habitat. Scientists saw no rebound in population in the projections that stretched to the year 2100.

The scientific models attempted to predict the effects on polar bear populations under two scenarios - one in which greenhouse gas emissions stabilised and the other in which they continued unabated.

Under either scenario, the bears in the Alaska, Russia and Norway group with an estimated population of about 8,500 would start to be affected in either 2025 or 2030, said lead author Todd Atwood, an Alaska-based USGS research wildlife biologist.

Polar bears use sea ice for feeding, mating and giving birth. When the ice retreats in the summer, polar bears are forced to the land.

A study found the land based food would not help it adapt to the loss of sea ice. USGS did not predict specific number declines and instead projected whether a population would sea decrease.

"That's not to say we'll lose polar bears completely, but we think that they'll be at a greatly decreased distribution," Atwood said.- AP

Hindu, July 16, 2015

W.P.S.I. members visit Sapera Basti

Members of WPSI, led by its Presidents SK Banerjee, today, visited Sapara Basti at Banjarawala and interacted with the residents regarding their problems.

Mr. SK Banerjee said that the interaction with residents Kartar Singh, Sanjay Singh and other community members revealed that one of the grave concern to those people was daughters' marriage. They were literally begging for livelihood from adjacent villages on daily basis. Earlier they used to cure people from snake bite but now they were solely dependent on forest for their livelihood. The members of WPSI explained them about the importance of forest and wildlife and guided them not to harm the animal and eco-system.

Banerjee said that there were about 40 to 45 families of Banjara Community. Women's main problems were wood and fuel for cooking and drinking water. He said that most of them do not possess ration cards.

The other members of WPSI present on the occasion were senior executive members Abdul Aziz, Sudhir Raghav and Mohammad Shim.

Himachal Times May 25, 2015

Pangolins in peril : 20 kg Scales seized, 3 arrested

Hindustan Times had highlighted that the animal was unscrupulously being hunted for meat, scales. A massive consignment of 20 kg. Pangolin scales was seized here late on Thursday night. However, the matter was reported on Friday morning. Three people were arrested with the consignment while search is on for nine other involved in the illegal trade. To recall, in December *Hindustan Times* had published a report alerting the state forest department about thriving business of Pangolin scales, the animal being

hunted in Uttarakhand and scales being smuggled to Sikkim and from there to China

Director Rajaji National Park, SP Subuddhi told Hindustan Times, "Three people have been arrested and we are still searching for nine others. Those people were arrested from Mothrawala. We are trying to nab Kawa, one of the main accused, who is actively involved in Pangolin killing and smuggling activities."

The seizure was made in a joint operation of the state forest department, RNP, Wildlife Protection Society of India (WPSI) and EFFECT NGO. Chanchal, son of Ganga Nath, Naresh son of Bheena Nath, son of Kalo Nath were arrested. The accused admitted that they hunted Pangolin mainly in Rajaji Park and Dehradun. A case under Wildlife Protection Act of India was lodged against all.

Notably, Hindustan Times in its December 8, 2012 issue gave a comprehensive report on how Pangolin, schedule 1 animal, was hunted for its scales and meat. The story highlighted that snake charmers, particularly of Mothrawala and Bhaniyawala, close to RNP, were known to hunt this animal. Besides, its scales, famed for medicinal qualities, were smuggled to China via Sikkim.

Wildlife activists had written to the state forest department in January in this regard, but to no avail.

"We wrote to the state forest department about the involvement of snake charmers in hunting Pangolins, but no one took any notice," said Rajendra Agarwal, state head WPSI.

Abhishek Kumar of EFFECT NGO said sapera community in Rispana Bridge and in Haripur Kala, Kali ka Dhaal and Pathri in Haridwar and Bhaguwala in Najibabad was involved in illegal trade of Pangolin scales. In addition, Satyawan Bawariya of Samalkha in Panipat was known to smuggle the stock to Sikkim and from there to China.

The cost of Pangolin scales in Indian Market is estimated to be Rs. 10,000 per kg. Prices are much higher in the international market. A seizure of 390 kg. Pangolin scales in Aizwal, Mizoram in September 2012 was estimated to be worth Rs. 2.3 crore.

Hindustan Times, Feb. 10, 2015

उत्तर भारत में भी खत्म हो जायेगा पेंगोलिन

पूर्वोत्तर राज्यों में चायनीज पेंगोलिन (सल्लू सांप) के बाद अब उत्तराखण्ड समेत उत्तर भारत में मिलने वाले 'इंडियन थिक टेल्ड पेंगोलिन' के अस्तित्व पर खतरा मंडराने लगा है। उत्तर भारतीय राज्यों में इस शर्मिले और शांत प्रवृत्ति के वन्यजीव का लगातार हो रहा शिकार तो यही बयां करता है। स्थिति की भयावहता को इसी से समझा जा सकता है कि उत्तराखण्ड में ही बीते छह सालों में पेंगोलिन के करीब साढ़े चार कुंतल शल्क बरामद हो चुके हैं। यह बात भी सामने आ चुकी है कि भारत से इस जीव के शल्क चीन भेजे जा रहे हैं। बावजूद इसके पेंगोलिन को बचाने की दिशा में अभी तक कोई ठोस पहल नहीं की पाई है।

भारत के पूर्वोत्तर क्षेत्र में चायनीज पेंगोलिन का इस कदर शिकार हुआ कि वहां यह जीव संकटापन श्रेणी में शामिल हो गया। पिछले कुछ सालों से पूर्वोत्तर में पेंगोलिन के शिकार में कमी आई तो शिकारियों ने उत्तर भारत के राज्यों में मिलने वाले भारतीय प्रजाति के पेंगोलिन (इंडियन थिक टेल्ड पेंगोलिन) को निशाना बनाना शुरू कर दिया।

उत्तराखण्ड, उत्तर प्रदेश, हिमाचल, जम्मू-कश्मीर, हरियाणा आदि राज्यों में हो रहे पेंगोलिन के शिकार से इस जीव के अस्तित्व पर संकट के बादल मंडराने लगे हैं।

उत्तराखण्ड में भी तराई और तलहटी वाले क्षेत्रों में पेंगोलिन का लगातार शिकार हो रहा है। राजाजी नेशनल पार्क समेत इससे लगे हरिद्वार, देहरादून, लैंसडौन वन प्रभागों में स्थिति और नाजुक है। विभागीय आंकड़ों पर ही गौर करें तो पिछले छह सालों में अब तक पेंगोलिन के साढ़े चार कुंतल शल्क बरामद हो चुके हैं। ये मामले तो पकड़ में आ गए, लेकिन इस जीव का शिकार कर शल्क की तस्करी बड़े पैमाने पर हो रही है। विभागीय सूत्रों की माने तो पेंगोलिन का शिकार करने के बाद शिकारी इन्हें बावरिया गिरोहों तक पहुंचाते हैं। बावरिया गिरोह से पेंगोलिन के शल्क नेपाल और म्यांमार के रास्ते चीन पहुंचाए जाते हैं, जहां शक्तिवर्द्धक दवाओं में इनका उपयोग किया जाता है। जानकारों के मुताबिक जिस हिसाब से उत्तर भारत के राज्यों में पेंगोलिन का शिकार हो रहा है, उसे देखते हुए इस जीव के इतिहास के पन्नों में सिमटते देर नहीं लगेगी।

दैनिक जागरण, 28 दिसम्बर, 2015

पेंगोलिन के शल्क के साथ एक दबोचा

सूबे में पेंगोलिन के शिकार की घटनाएं थमने का नाम नहीं ले रहीं। कोतवाली की हरबर्टपुर पुलिस चौकी के सामने रविवार को चेकिंग के दौरान एसटीएफ और पुलिस की संयुक्त कार्रवाई में बाइक सवार हिमाचल निवासी एक व्यक्ति को पेंगोलिन (सल्लू सांप) के सात किलो शल्क के गिरफ्तार किया गया। उसके खिलाफ वन्य जीव संरक्षण अधिनियम के तहत मुकदमा दर्ज किया गया है। एसटीएफ ने उससे लंबी पूछताछ भी की। बता दें कि इससे पहले दो जनवरी को देहरादून के मोथरोवाला सपेरा बस्ती में पेंगोलिन का मांस बरामद हुआ था।

मिली जानकारी के अनुसार रविवार को हिमाचल के एक व्यक्ति द्वारा हरबर्टपुर के रास्ते वन्यजीव अगों की तस्करी की सूचना मिलने पर एसटीएफ और हरबर्टपुर पुलिस ने जाल बिछाया। इसके तहत हरबर्टपुर पुलिस चौकी के पास ही एसटीएफ और पुलिस ने मुख्य मार्ग पर वाहनों की चेकिंग शुरू कर दी। अपराहन करीब साढ़े तीन बजे टीम ने एक बाइक सवार को रोका। पुलिस के अनुसार बाइक के बैग की तलाशी लेने पर उसमें करीब सात किलो शल्क बरामद हुए।

इसके बाद वन प्रभाग के डिप्टी रेंजर आनंद सिंह रावत को भी मौके पर बुला लिया गया। डिप्टी रेंजर ने इन शल्कों के पेंगोलिन का होने की पुष्टि की। पुलिस ने बताया कि इसके बाद शल्क के साथ पकड़े गए हेमराज को गिरफ्तार कर लिया गया। पूछताछ में हेमराज ने बताया कि वह ग्राम बुतनपुर, पांवटा साहिब भाटा मंडी जिला सिरमौर हिमाचल प्रदेश का निवासी है। पुलिस के मुताबिक पूछताछ में हेमराज ने बताया कि वह पेंगोलिन के शल्क लेकर हरिद्वार जा रहा था, जहां इसकी सप्लाई नेपाली मूल के व्यक्ति को होनी थी। आरोपी की बाइक सीज कर दी गई है।

दैनिक जागरण, 28 दिसम्बर, 2015

पेंगोलिन के शल्क के साथ तस्कर बंदी

एसटीएफ की टीम ने एक वन्य जीव तस्कर को पेंगोलिन (सल्लू सांप) के 10 किलोग्राम शल्क के साथ गिरफ्तार कर लिया। टीम के तस्कर मुकेशनाथ उर्फ कन्हैया उर्फ कान्हा उर्फ काला पुत्र हरिनाथ उर्फ हरिया निवासी ग्राम जस्सावाला थाना सहसपुर को डोईवाला थाना क्षेत्र के सपेरा बस्ती लिंक रोड से गिरफ्तार किया। पूछताछ में उसने बताया कि वह शल्क को हिमाचल के किसी तस्कर को बेचता है। पेंगोलिन वन्य जीव जंतु संरक्षण अधिनियम में अनुसूचित एक के अंतर्गत आता है। जो विलुप्त प्रजातियों में शामिल है। एसटीएफ गिरफ्तार तस्कर से उसके नेटवर्क के बारे में पूछताछ कर रही है। मंगलवार को आरोपी को कोर्ट में पेश किया जाएगा। एसटीएफ एसएसपी सेथिल अवुदाई ने बताया कि सल्लू सांप के शल्क की तस्करी बड़े पैमाने पर की जा रही है, जिसके नेटवर्क को तोड़ने के लिए एसटीएफ की टीम लगी हुई है।

दैनिक जागरण, 4 नवम्बर, 2014

सल्लू सांप के शल्क के साथ तीन बंदी

राजाजी नेशनल पार्क में सल्लू सांप (पेंगोलिन) भी शिकारियों के निशाने पर हैं। विलुप्ति के कगार पर खड़े इस जीव के 30 किलोग्राम शल्क (खाल) के साथ पिता-पुत्र समेत तीन को गिरफ्तार किया गया है। फरार आरोपियों की तलाश की जा रही है।

पार्क के उपनिदेशक एचकेसिंह ने शुक्रवार को पत्रकारों को बताया कि 15 फरवरी को कुछ लोग पार्क की कांसरो रेंज के कंपार्टमेंट-13 में घुस गए थे। सूचना मिलने पर मौके पर पहुंचे वनकर्मियों को देख सभी भाग निकले थे। मौके से एक मोबाइल, तीन बल्लम, दो फावड़े, गैंती के अलावा पतीले गिलास आदि बरामद किए गए। श्री सिंह के मुताबिक मोबाइल को सर्विलांस पर लगाया गया है। साथ ही, इफेक्ट और डबल्यूपीएसआई संस्था के सहयोग से सुरागशी भी तेज कर दी गई।

इस बीच गुरुवार रात करीब साढ़े बारह बजे पार्क के बनवाह कंपार्टमेंट से सपेरा बस्ती भानियावाला निवासी चंचलनाथ को पकड़ा गया। पूछताछ करने पर उसने जंगल में सल्लू सांप के शिकार को जाने की बात स्वीकारी इसके बाद उसकी निशानदेही पर मोथरोवाला क्लेमेनटाउन निवासी उसके ससुर भीनानाथ और साले नरेशनाथ को गिरफ्तार कर लिया। इनके पास से 30 किग्रा सल्लू सांप के शल्क बरामद किए। पूछताछ में तीनों ने बताया कि उन्होंने 20 से ज्यादा सल्लू सांपों का कत्ल किया, जिनके ये शल्क हैं। इन्हें दिल्ली की एक पार्टी को सप्लाई किया जाना था। पकड़े लोगों को शुक्रवार को अदालत में पेश करने के बाद जेल भेज दिया गया।

अब बचेगा पेंगोलिन

प्रदेश के जंगलों में बड़ी संख्या में शिकार किए जा रहे पेंगोलिन और अन्य वन्यजीवों को बचाने की कवायद वन विभाग ने शुरू कर दी है। वन मुख्यालय ने एंटी पोचिंग टीम को मजबूत बनाने का प्रस्ताव शासन को भेज दिया है। इसके अलावा टीम के लिए अतिरिक्त स्टाफ और पुलिस से सहयोग की मांग भी की गई है।

अमर उजाला ने बुधवार के अंक में प्रदेश में पेंगोलिन के शिकार के बढ़ते मामलों का खुलासा किया था। प्रमुख वन संरक्षक एसएसशर्मा ने बताया कि उन्होंने बुधवार को नए सिरे से एंटी पोचिंग टीम को मजबूती देने के लिए

प्रस्ताव भेज दिया है। पहले भी दो बार प्रस्ताव भेजा गया है। लेकिन इस बार सरकार से तीन वार्डन की तुरंत मांग की गई है। ये वार्डन कोटद्वार, उत्तरकाशी और धारचूला में तैनात किए जाएंगे। हर वार्डन के साथ एक रेंजर, एक फॉरेस्टर और दो फॉरेस्ट गार्ड की मांग की गई है। शर्मा ने बताया कि हर टीम को पेट्रोलिंग के लिए गाड़ी की मांग भी शासन की है। प्रमुख वन संरक्षक ने बताया कि फ्रंटलाइन स्टाफ को भी प्रशिक्षित करने की योजना है। साथ ही पुलिस के साथ मिलकर तस्करी पर लगाम कसने की भी योजना इसमें शामिल की जाएगी।

अमर उजाला, 06 जून, 2014

वन्य जीवों के मांस के साथ पांच सपेरे दबोचे

देहरादून वन प्रभाग की आशारोड़ी रेंज में घुसे पांच लोगों को वनकर्मियों ने धर दबोचा। इनमें दो हिमाचल प्रदेश और बाकी देहरादून के हैं। इनके पास से सेही का मांस, मृत सीवेट कैट आदि बरामद हुए। विभाग के मुताबिक सपेरा जाति के इन लोगों से हुई पूछताछ में इनके किसी गिरोह से सम्बन्ध की बात सामने नहीं आई है।

उप प्रभागीय वन अधिकारी गुलवीर सिंह ने बताया कि रविवार को आशारोड़ी रेंज की चंद्रबनी बीट में संदिग्ध लोगों के घुसने की सूचना मिली थी। इसके बाद वनक्षेत्राधिकारी एडी सिद्धीकी की अगुवाई में वनकर्मियों की टीम ने जंगल में छापा मारा। इस दौरान जंगल में मिले पांच लोगों को रोककर उनसे पूछताछ की गई तो वे संतोषजनक जवाब नहीं दे पाये। उनके पास मौजूद थैलों की जांच की गई तो इनमें सेही का भूना हुआ मांस, एक मृत सीवेट कैट, दो टॉर्च, भगोना, खाद्य सामग्री बरामद हुई। इसके बाद पांचों को गिरफ्तार कर लिया गया।

श्री सिंह के मुताबिक पकड़े गए लोगों में हिमाचल प्रदेश निवासी बीतानाथ (वातापुल, वातामंडी) व सूरज (कृपशिला, पांवटा साहिब) के अलावा देहरादून के राजानाथ, रवीनानाथ उर्फ रविनाथ और चांदनाथ (सपेरा बस्ती रिस्पना पुल) शामिल हैं। पांचों के खिलाफ वन्य जीव संरक्षण अधिनियम के तहत मुकदमा दर्ज कर लिया गया है। सभी आरोपियों को सोमवार को अदालत में पेश किया जायेगा। उन्होंने बताया कि अभी तक की पूछताछ में इनके किसी गिरोह से ताल्लुकात की बात सामने नहीं आई है। लेकिन इनके बारे में जानकारी जुटाई जा रही है।

दैनिक जागरण, 10 नवम्बर, 2014

बिज्जू और सेही के साथ पांच तस्कर धरे

वन विभाग की टीम ने रविवार को एक बिज्जू और सेही के साथ आशारोड़ी रेंज से पांच तस्करो को गिरफ्तार किया है। चंद्रबनी बीट से दबोचे गए इन तस्करों में तीन तस्कर राजा, रविनाथ, चांदनाथ राजपुर रोड सपेरा बस्ती व दीपानाथ और सूरज पांवटा साहिब गुरुद्वारा रोड के रहने वाले हैं।

रेंजर ईडी सिद्धीकी की अगुवाई में यह कार्रवाई की गई। कार्रवाई के लिए गई टीम में वन दरोगा एसपी ध्यानी, फॉरेस्ट गार्ड नंदकिशोर सेमवाल, राजपाल, मोहनलाल, हरीश चंद्र शर्मा शामिल रहे। रेंजर ने बताया कि गिरफ्तार तस्कर सोमवार को कोर्ट में पेश किए जाएंगे।

हिन्दुस्तान, 10 नवम्बर, 2014

तीन मॉनिटर लिजार्ड के साथ दो दबोचे

बुधवार शाम वन विभाग की टीम ने दो वन्य जीव तस्करों को तीन जिवित मॉनिटर लिजार्ड (गोह) के साथ गिरफ्तार कर लिया। तस्करों ने इन्हें झाझरा रेंज के जंगलों से पकड़ा था। गुरुवार को आरोपियों को न्यायालय में पेश किया जायेगा।

प्रभागीय वनाधिकारी पीके पात्रो ने बताया कि बुधवार को झाझरा रेंज के धूलकोट वन क्षेत्र में वन विभाग की टीम गश्त कर रही थी। उसी दौरान टीम ने एक बाइक (यूके 07 वी 4170) को रोका। बाइक के पीछे एक कुत्ता भी चल रहा था। बाइक की तलाशी ली गई तो उसमें से तीन जिवित गोह बरामद हुई। पूछताछ में आरोपियों ने अपने नाम रविन्द्र पुत्र चरण सिंह और गोविन्दा पुत्र राजफूल निवासी सपेरा बस्ती, सहसपुर बताया।

कुत्ते की मदद से पकड़ते हैं :-

मांस और खाल के लिए होने वाले गोह के शिकार को शिकारी कुत्तों की मदद लेते हैं। जानकारों के मुताबिक शिकारी अपने साथ कुत्ते को लेकर जाते हैं। कुत्ता सूंधकर पता लगाता है कि गोह कहां पर है। इसके बाद बिल में घुसे गोह को तस्कर पकड़ लेते हैं। बुधवार को गोह के साथ पकड़े गए शिकारियों के पास से भी कुत्ता बरामद हुआ।

पूँछ गर्दन में घूमाकर बांधते हैं :-

गोह को पकड़ने के बाद शिकारी उसकी पूँछ को गर्दन से घुमाकर बांध देते हैं। ऐसे में वह छूट नहीं पाता और उसके पांच-छह घंटे तक ज़िंदा रहने की उम्मीद रहती है। गोह को मारने के बाद उसकी खाल को निकाल लिया जाता है और इसकी तस्करी भी होती है।

दैनिक जागरण, 25 जून, 2015

सुंदरबन में जलवायु परिवर्तन पर नजर

सुंदरबन के पशुओं और वनस्पति पर जलवायु परिवर्तन के प्रभाव का अध्ययन करने के लिए जूलॉजिकल सर्वे ऑफ इंडिया (जेडएसआई) ने मैंग्रोव वनों के भीतर निरीक्षण केंद्र बनाए हैं। पांच द्वीपों बाली, गोसाबा, बसन्ती, सागर और सतजेलिया में 25 ऐसे भूखंड हैं, जहां ये केंद्र स्थापित किये गए हैं ताकि मैंग्रोव, केकड़ों और घोंघों की संख्या एवं जैव विविधता की माप की जा सके।

इस परियोजना के प्रभारी वैज्ञानिक बुलगानिन मित्रा ने बताया 'इनकी संख्या में होने वाले किसी बदलाव से यह पता चलेगा कि जलवायु परिवर्तन किस तरह से इन द्वीपों को प्रभावित कर रहा है। हम जान पायेंगे कि जल में लवणता की मात्रा और अन्य कारकों के कारण जैव-विविधता किस हद तक प्रभावित हो रही है।' अध्ययन की प्रक्रिया जारी है और विशेषज्ञों को इनकी संख्या एवं प्रजातियों से जुड़े आंकड़े जुटाने के लिए मौके पर भेजा गया है। उन्होंने कहा 'हम वहां तस्वीरें भी खींचेंगे और उनके आवास का जीपीएस नक्शा भी तैयार करेंगे। हम जैव विविधता का मूल डेटा तैयार करेंगे। समय बीतने के साथ हम यह जान पाएंगे कि उस क्षेत्र में पशुओं और वनस्पति में कोई बदलाव हुआ है या नहीं।' ये निरीक्षण केंद्र अब तक मैंग्रोव वन के बफर जोन में स्थापित किए गए हैं। उन्होंने बाघ अभारण्य के मूल क्षेत्र के भीतर ऐसे और केंद्र शुरू करने के लिए राज्य वन विभाग से अनुमति ली है।

यूनेस्को का वैश्विक विरासत स्थल सुंदरबन एक सौ से अधिक द्वीपों का एक समूह है। यह अपने मैंग्रोव वनों

के लिए और रॉयल बंगाल टाइगर, गंगा एवं इरावडी डॉल्फिनों के लिए प्रसिद्ध है। ये द्वीप लगातार भूमि अपरदन और समुद्र स्तर बढ़ने के कारण होने वाली लवणता से बुरी तरह प्रभावित होते हैं। जेडएसआई पशुओं पर पड़ने वाले प्रभाव का अध्ययन करेगा जबकि बॉटैनिकल सर्वे ऑफ इंडिया वनस्पतियों पर पड़ने वाले प्रभाव का अध्ययन करेगा। केंद्रीय पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय से वित्तपोषित परियोजना के तहत, उन्होंने क्षेत्र के आठ बड़ी मैंग्रोव प्रजातियों पर कीट परागण का अध्ययन भी शुरू कर दिया है।

रासायनिक कीटनाशकों, जलवायु परिवर्तन, प्रदूषण जैसे विभिन्न कारणों के चलते दुनिया के विभिन्न हिस्सों में परागण कर्ताओं की संख्या में कमी आई है। कई फल, बादाम और सब्जियों का परागण मधुमक्खियों के जरिए होता है। मित्रा ने कहा 'मधुमक्खियों भौरों, तितलियों जैसे कीटों के कारण परागण हो रहा है लेकिन हम नहीं जानते कि सबसे बड़े परागण कर्ता कौन हैं। ये हमें हमारी वनस्पति प्रजातियों को बचाने में मदद कर रहे हैं।' खाद्य सुरक्षा और हमारे वनों के संरक्षण के लिहाज से परागण कर्ताओं का संरक्षण जरूरी है। यह तीन वर्षीय निरीक्षण परियोजना उन्हें सुंदरवन के मैंग्रोवों में कीट परागण का डेटाबेस बनाने में मदद करेगी।

राष्ट्रीय सहारा , 03.जुलाई, 2015

ईको सेंसेटिव जोन लागू करने की कवायद तेज

सर्वोच्च न्यायालय के निर्देश पर मसूरी को ईको सेंसेटिव जोन में शामिल करने की कवायद तेज हो गई है। जिसको लेकर उप वन संरक्षक मसूरी वन प्रभाग डा. धीरज पांडे ने मसूरी के इस्टेट स्वामियों के साथ वार्ता की व ईको सेंसेटिव जोन के बारे में विस्तार से जानकारी दी और बताया कि रिपोर्ट उच्चाधिकारियों को भेजी जा रही है जिसे शासन को भेजा जायेगा और कैबिनेट में आने के बाद मुख्यमंत्री रिपोर्ट को केंद्र सरकार को भेजी जायेगी। वहीं विभाग से इस्टेट स्वामियों को सुझाव व आपत्तियां दर्ज करने का समय दिया जायेगा।

मसूरी वन प्रभाग कार्यालय में डीएफओ डा. धीरज पांडे ने इस्टेट स्वामियों के साथ ईको सेंसेटिव जोन को लेकर बैठक की व इसकी पूरी जानकारी दी। व बताया कि मसूरी का बाहरी हिस्सा ईको सेंसेटिव जोन में शामिल किया गया है। उन्होंने यह भी बताया कि नेशनल पार्क और वाइल्ड लाइफ सेंचुरी की सीमा के बाहर शहरी क्षेत्र में 100 मीटर के क्षेत्र को इससे मुक्त रखा गया है। उन्होंने बैठक की जानकारी देते हुए बताया कि भू स्वामियों के साथ बैठक सकारात्मक रही। जिन्हें ईको सेंसेटिव जोन के बारे में पूरा बताया गया। कि यह किस क्षेत्र में किस तरह लागू किया जायेगा। उन्होंने बताया कि सर्वोच्च न्यायालय ने ईको जोन अनिवार्य किया है लेकिन जनता की सुविधा को देखते हुए इसमें शिथिलता दी गई है। जो नेशनल पार्क व वाइल्ड लाइफ सीमा में 100 मीटर तक लागू नहीं होगा। वहीं इसमें ऐसा कोरिडोर छोड़ा जायेगा ताकि जानवरों को आने जाने में परेशानी न हो सके। उप वन संरक्षक डा. धीरज पांडे ने बताया कि ईको सेंसेटिव जोन लागू होने पर विकास योजनाओं को लागू करने में कोई बाधा नहीं आयेगी न ही कोई योजना प्रभावित होगी। जो एनओसी किसी योजना के लिए पहले ली जाती थी उसके साथ ईको सेंसेटिव जोन की एनओसी लेना जरूरी किया गया है व एनओसी के बाद कार्य किया जा सकता है। वहीं यह भी कहा सर्वोच्च न्यायालय का स्पष्ट निर्देश है कि हवाई क्षेत्र में 10 किमी पर ईको सेंसेटिव जोन लागू किया जाय जिसमें कुछ नहीं बचता लेकिन विरोध के बाद जनता की परेशानी को देखते हुए इसमें रियायत दी गई है।

केवल प्रदूषण वाले उद्यानों को छोड़ कर कोई योजना इससे प्रभावित नहीं होगी।

ईको सेंसेटिव जोन की बैठक में शामिल भू स्वामी डीके जैन का कहना है कि ईको सेंसेटिव जोन को लेकर यह पहली बैठक है इसमें आगे क्या होगा कहा नहीं जा सकता एक माह में सुझाव एवं आपत्ति देने का समय दिया गया है। लेकिन यह निश्चित है कि इसके लागू होने से परेशानी आयेगी क्योंकि पहले ही मसूरी में कई प्रकार के प्रतिबंध लगे हैं और उसमें यह भी हो जायेगा तो परेशानी तो होगी ही। और इसका खामियाजा जनता को भुगतना पड़ेगा। व प्राइवेट स्टेट की काफी भूमि इसमें आ जायेगी। वहीं जबर खेत नेचर रिजर्व की निदेशक सीजल वोहरा ने कहा कि ईको सेंसेटिव जोन पर स्टेट स्वामियों से चर्चा की गई के इससे आने वाले समय में क्या परेशानी होने वाली है, इस पर भू स्वामियों को शंका है, लेकिन उन्होंने यह भी कहा कि प्राइवेट इस्टेट वाले जबर खेत नेचर पार्क की तर्ज पर पार्क बना सकते हैं इसमें ईको सेंसेटिव जोन होने के बाद भी परेशानी नहीं होंगी केवल पक्का निर्माण नहीं कर सकते। उन्होंने कहा कि इससे प्रकृति प्रेमी पर्यटकों को आकर्षित कर रोजगार के साधन बनाए जा सकते हैं व पर्यटन भी बढ़ेगा। तथा वन विभाग के साथ मिलकर भी योजना बना सकते हैं। ईको सेंसेटिव जोन लागू होने पर मसूरी के प्राइवेट इस्टेटों एवं आस पास के ग्रामीण क्षेत्रों की 2055.99 हैक्टेयर भूमि इसके अंतर्गत आ जायेगी।

दैनिक जागरण 25 मई 2015

तस्करों से बरामद हुए दुर्लभ किस्म के कछुए

तस्करी कर ले जाए जा रहे विलुप्त प्रजाति के 50 कछुओं को उन्नाव (उ.प्र.) में प्रमुख सचिव वन, जिलाधिकारी के अलावा वाइल्ड लाइफ अधिकारियों की मौजूदगी में नवाबगंज पक्षी विहार स्थित कुल्ली वेन में छोड़ दिया गया। अंतरराष्ट्रीय बाजार में इन कछुओं की कीमत काफी मंहगी आंकी जा रही है।

पिछले दिनों मुंबई हवाई अड्डे पर तस्करों की गिरफ्त से 50 दुर्लभ प्रजाति के कछुओं को कस्टम अधिकारियों से बरामद करने के बाद उत्तर प्रदेश सरकार को सौंप दिया गया था। इन कछुओं को शुक्रवार को प्रमुख सचिव वन व वाइल्ड लाइफ अधिकारियों व जिलाधिकारी सौम्या अग्रवाल ने नवाबगंज पक्षी विहार झील में छोड़ दिया। ये कछुए विशेषकर उत्तर प्रदेश की ही झीलों व नदियों में पाए जाते हैं। इसलिए महाराष्ट्र सरकार ने इन्हें उत्तर प्रदेश सरकार को सौंप दिया।

ट्रांसपोर्टेशन सिक्युरिटी एडमिनिस्ट्रेशन के देश स्तर के एशिया प्रमुख पीटर क्लाइन, भारत के लुप्तप्राय जीव जंतु के निदेशक, डॉक्टर शैलेंद्र सिंह, शिक्षा निदेशक, भास्कर दीक्षित और सतीश यादव को महाराष्ट्र सरकार के अधिकारियों ने हवाई अड्डे पर तस्करी कर ले जाए जा रहे 375 कछुओं को सौंपा था। इन कछुओं में प्रत्येक की कीमत कम से कम 30 हजार रुपए अंतरराष्ट्रीय बाजार में आंकी गई है।

जनसत्ता, 26 जुलाई, 2015

New Members of W.P.S.I (2015)

Life Members

1. Mr. Alok Negi
300, Model Town
Araghgar, Dehradun
(Uttarakhand)
2. Mr. Aruha Kr. Banerjee
35-C Charu Avenue
2nd Floor, Kolkata
(West Bengal)
3. Mr. Pankaj Tondan
112/2014, A, Swaroop Nagar
Kanpur City
(Uttar Pradesh)
4. Dr. M.K. Purohit
421 - B, Khubura Mohalla
Dehradun
(Uttarakhand)
5. Aishwarya Ranjan
34 Karanpur
Dehradun
(Uttarakhand)

Annual Members

1. DR. D.K. Gupta
Deptt. of Botany
D.A.V. (P.G.) College
Dehradun
(Uttarakhand)
2. Mr. Manish Dev
28, Man Singh Wala
Dehradun
(Uttarakhand)
3. Mr. Pradeep Dobhal
9 Vikas Loke Lane No.1
Sahastradhara Road
Dehradun
(Uttarakhand)
4. Dr. G.C. Pant
Vill. Lohariya Sal Malla
P.O. Kathghariya
Haldwani, Distt. Nainital
(Uttarakhand)
5. DR. R.M. Saxena
76.96, Saket, Rajpur Road
Dehradun
(Uttarakhand)

The Wildlife Preservation Society of India

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The Wildlife Preservation Society of India

The aims and objects of the Society are as follows :-

1. To promote interest and impart knowledge regarding the preservation and conservation of all forms of wildlife, particularly among the youth of the country.
- (a) To cooperate with the Govt. of India and State Governments and with others Societies and Institutions having similar aims and objects in working for the interests of wildlife.
- (b) To assist in enforcing and actively supporting the Forests Acts. Wild Birds and animals Protections Acts and Rules etc. of State Governments and the Indian Arms Act and Rules in so far as they pertain to wildlife and to bring to the notice of the authorities any infringement of the same and to assist in the detention and prosecution of offenders in respect of such laws.
- (c) To advise and help the Govt. and wildlife administrators in the formation, maintenance and protection of Sanctuaries and National Parks, preservation of wildlife in general and endangered species of India in particular and in the introduction of exotic species into the country, rehabilitation of endangered species etc. and in the formulation and amendments of rules and acts, so as to conserve and increase wildlife stocks.
- (d) To raise funds for carrying out the above aims and objects and to found and maintain museums reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.
- (e) To carry out publicity and propaganda for the preservation of wildlife in India by means of monographs, journals, films, filmstrips and other feasible methods.
- (f) To assist members of the Society in obtaining facilities for viewing and photographing wildlife in India.
- (g) To conduct research into the problem of Wildlife management in India, and in pursuance of this, to initiate, encourage and, where possible assist in the projects of the study of threatened species and related objects and to provide reference and research facilities for such work.
- (h) To carry on such other activities which will serve the above subjects.
- (i)

2. What membership of Wildlife Preservation Society of India will entitle you to ?

- (1) You will become an active member of the growing group of Wildlife enthusiasts, who enjoy working for and spreading the knowledge of how to conserve India's heritage of wildlife for posterity.
- (2) You will be entitled to the full use of the library of the Wildlife Preservation Society and of its reading room.
- (3) You will receive a membership certificate.
- (4) You will receive a personal Identification and Membership Card.
- (5) You will be entitled to buy all publications of the Society at a concessional rate.
- (6) You will be entitled to buy at concessional rates the Societies Greeting Cards, Calendars. Tie, Label badges and the Balance of Nature Game (specially Published in colour for its educative and recreational values).
- (7) You will be supplied "Cheetal", the quarterly journal of the society free.

3. For membership particulars write to Honorary Secretary, Wildlife Preservation Society of India 7 Astley Hall, Dehra Dun.

Guide Lines for Authors

The editors will consider papers for publications based on the novelty of their immediate or future impact on wildlife (Non-domestic, Terrestrial, Aerial and aquatic animals and plants).

1. Manuscripts should be written in clear and simple language either in English or Hindi, we publish both and should be typed in double line spacing with wide margins on one side of the paper. Form and content should be carefully checked to exclude the need for correction in proof. Necessary changes will be made in manuscript, if needed. Photographs should be on glossy paper and about post card size.

2. It should start with title of the paper, first name(s) and surname of author(s) institute and footnotes referring to the title to be indicated by asterisks, full address(es) of the author(s), If there are several institutes, and places make the affiliation clear.

3. At least one author must be member (Annual or life) of the society at the time of submission of MS. Scientific names should be in italics or underlined. All abbreviations and units of measurement must conform to the international standards.

4. **Summary** : Each paper should be preceded by a summary or abstract. The summary should state what was investigated and what are the findings, and conclusion followed by introduction. materials and methods, Results and Discussion, Reference and acknowledgement.

5. **Key words**: Below the summary or abstracts, upto 5 key-words should be written for subject indexing

6. The list of references should include only works referred into the text. They should be cited as follows:

Research Paper : Names and initials of all authors, year, full title, journal as abbreviated in index medicus, volume with number, first and last page numbers.

Books: Name of authors, year, full title, edition, publishers and place.

7. **Figures**: The number and size of the illustration must be kept to the minimum required for clarification of the text. Explanation of figures furnished as legends should be below the figure.

8. Short notes or reports of observations on wildlife of special interest will be published. Short communications without headings will be given top priority in the editorial and publication process.

9. In the section, letters to the editor, important and specific problems (also negative results) can be published.

10. Five reprints will be supplied on gratis.

11. Manuscripts should be submitted one hard copy with CD to the editor Cheetal, Wildlife preservation society of India or email to wpsiddn@gmail.com or drpsingh1949@gmail.com.



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E-mail : wpsiddn@gmail.com

THE WILDLIFE PRESERVATION SOCIETY OF INDIA

(Established 1958)

Heritage Appartment Flat No. 2 First floor, 18 New Road, Dehra Dun.

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Elephant and Tiger are taking bath

Photo by Mr. Mansoor Mazhar